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ABSTRACT

This Strategic Plan aims to address the issues facing California Community Colleges (CCCs) due to new technology. The issues raised by the report include: (1) the pervasive and economically and socially necessary use of the Internet; (2) the digital divide; (3) the need for integrating technology into teaching and learning; (4) the impact of Tidal Wave II on demand for college access; and (5) access to technology for persons with disabilities. The focus of the plan is in the two major areas of student access and student success. The plan suggests that familiarity with computers is an essential element of economic success, particularly in California. The CCC system, in partnership with the State of California and the private sector, has formed the Technology and Telecommunications Infrastructure Program (TTIP) in an effort to focus on these technological needs. TTIP funding has been used to provide: (1) data via connection to the California Community Colleges and California State University network; (2) video conferencing capabilities at each college and district site; (3) dual satellite downlink capability for each college and district office; and (4) library automation. Nevertheless, there are still gaps in the CCC's technology needs, which have been identified and for which remedies have been proposed. (NB)

California Community Colleges

Technology II

Strategic Plan

2000-2005

September 2000

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Executive Summary

The California Community Colleges face compelling challenges in serving the students of today:

- the explosive use of the Internet as a required occupational and citizenship skill;
- the Digital Divide;
- the necessity for integration of the new technology into teaching and learning;
- the impact of *Tidal Wave II* on demand for college access; and
- ensuring that technology is accessible to persons with disabilities.

The vision for the use of technology is that the California Community Colleges will use it to enable students and communities to be successful in a knowledge-based society by providing universal access to quality learning.

This *Technology II Strategic Plan* focuses on two major goals:

- ***Student Access***—*Promote student access to the California Community Colleges including access to instruction and student support services.*
- ***Student Success***—*Promote students' success in their educational and career goals.*

The cost estimate for this *Tech II Plan* is based upon a Total Cost of Ownership (TCO) model, which includes not only hardware and software but also the vital related components of support staffing and staff development. Community colleges currently are investing over $73 million per year in telecommunications and technology, or about $73 per FTES, but it is not enough to meet the goals identified above. The colleges require a substantial infusion of funds in order to meet the growing technological needs of students, faculty and staff. This *Tech II Plan* would provide additional resources into the system's base each year for five years. The funding of this *Tech II Plan* would involve a collaborative effort of two major stakeholders: the State and the private sector.

Preface

The *California Community Colleges Technology II Strategic Plan* provides the broad template of strategies for improving and strengthening technology throughout the California Community College system. The Board of Governors recognizes that the *Tech II Plan* will guide a complex undertaking to be implemented in a changing environment.

Consequently, some of the pieces of the *Tech II Plan* will require further discussion and development as they are implemented. Accordingly, the Board of Governors adopts the *California Community Colleges Technology II Strategic Plan, 2000-2005,* with the understanding that it will be subject to ongoing evaluation and review, using the system's established consultation process.

Acknowledgements

The Board of Governors committed to developing a technology plan for the system in its *California Community Colleges 2005: A Strategic Response for Enabling Community Colleges to Make a Defining Difference in the Social and Economic Success of California in the 21st Century*. In collaboration with the following entities, the *California Community Colleges Technology II Strategic Plan, 2000-2005* was developed.

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San Diego City College

Santa Rosa Junior College

Vision for Technology in the California Community Colleges

Technology is changing the world—including many aspects of education. The Internet and other information and communications technologies are changing the way people work, learn, communicate with each other, and do business. These technologies are shaping the economy and society in the same way that the steam engine and electricity defined the Industrial Age. The world is becoming increasingly digital, and higher education must upgrade its infrastructure and business practices to take advantage of the speed and benefits of digital technology.

The California Community Colleges (CCCs) are using technology to enable students to be successful in their academic careers, as citizens and as workers in a knowledge-based society. The CCCs provide universal access to quality education, as evidenced by this mission statement:

> *To provide open access to academic and vocational instruction at the lower division level for both younger and older students, including those persons returning to school, as well as to advance California's economic growth and global competitiveness through education, training, and services that contribute to continuous work force improvement.*

In recent years, information technology has driven the U.S. economy. Businesses are scrambling to use the Internet to increase productivity, boost exports, cut the time required to develop new products, and forge closer relationships with customers and suppliers. The current federal administration has pursued a market-led approach to global electronic commerce that relies whenever possible on private sector leadership and seeks to eliminate legal and regulatory barriers to electronic commerce while protecting the public interest.

The California economy has been driven by information technology (IT) even more than has the national economy. California is a technology state, serving as the birthplace of many of the discoveries leading to the information age, and home to many of the major companies involved in creating this new future. Technology firms continue to be major employers within the state, and many technology-based occupations remain understaffed for the lack of skilled workers. This IT-driven economy has placed some unprecedented responsibilities on the community colleges in responding to the state's needs for an educated citizenry. As early as 1997, a research report by Rand, "Breaking the Social Contract, The Fiscal Crisis in Higher Education," stated:

> *Recent shifts in California's economy have made higher education more significant than ever. The industrial jobs that once formed the backbone of the economy are dwindling. The service-related jobs that are taking their place require a level of knowledge and skill that, for the most part, can be gained only through programs offered at California's colleges and universities. If workers in today's economy are cut off from higher education, they will be unable to attain the proficiency levels needed to master new technologies and enter new occupations.* [p. 4]

The Digital High School Program (AB 64, Statutes of 1997) requires that all high schools in the state become "digital high schools" by the end of the first decade of the 21st century. It requires that these schools fully integrate computers, networks, training and software to achieve computer literacy in all pupils and faculty, and to improve academic achievement. Sixty-six percent (66%) of California Digital High School students who attend a public California college or university after high school graduation will attend a California Community College.

Scott A. Langhorst, "Changing the Channel: Community Colleges In The Information Age," states that "community colleges must chart a new course using technology to navigate through the shoals of access, accountability, diversity and quality."[Vol. 25, no. 3, p. 55 (1997)] The colleges must be prepared to serve these students, as well as their older counterparts seeking training and education, with state-of-the-art classrooms and student support services, and skilled faculty and staff.

Technology Challenges Facing the California Community Colleges

This *Tech II Plan* addresses itself to critical technology challenges facing the California Community Colleges.

Technology in California—In California, even more than in the rest of the United States, familiarity with the use of computers is fundamental to economic success. As noted above, California is a technology state, serving as the birthplace of many of the discoveries leading to the information age, and home to many of the major companies involved in creating this new future. Therefore, it is no longer viable to expect California Community College students to function without a baseline of networks, hardware and software similar to what they will confront every day in the workplace.

Tidal Wave II—The California Community Colleges Board of Governors, in *California Community Colleges 2005: A Strategic Response for Enabling Community Colleges to Make a Defining Difference in the Social and Economic Success of California in the 21st Century*, July 1998, reported that most of the increased enrollment demand for higher education in the 21st century will be served by the community colleges. The report also states that "...the colleges will expand appropriate use of technology in providing support services, performing administrative functions, and in delivering instruction to achieve optimum use in existing physical plant and in best meeting the learning needs of students."

Explosive Use of the Internet—Ability to use the Internet is becoming a required career skill, as a means of communication and an expanded source of information.

Digital Divide—Data from multiple sources make it clear: the Digital Age is having a disproportionate effect within minority and economically disadvantaged populations, and the distance across the divide is increasing. In addition to other issues that face these populations, they experience a significant lack of access to technology. The CCCs must not only provide these students with access to technology, but also ensure that they are able to use technology effectively and that they can adapt to the fast pace of change in the Digital Age.

Increased demand for the integration of technology in teaching[1]—The GartnerGroup research shows that the lack of readily available user assistance and support is a primary barrier to the successful adoption of new technology and new technology-enabled methods. Faculty will require assistance in finding the appropriate technology tools to achieve the desired outcomes and in learning to use the tools that are selected. Further, training in the use of the tools must not be limited just to an initial tutorial, but must also include ongoing assistance. The faculty member must be able to focus on the course content and that requires familiarity with the technology.

Sustainability of technology infrastructure—Sustainability is a major challenge facing higher education institutions in the 21st century, that is, keeping the technology current. Obsolete technology, which is common in colleges, is costly to support and it does not represent the type of environment that students will encounter in the workplace. There is also the challenge of ensuring that the underlying technologies of systemwide projects are sound and compatible with future technology directions.

Technology support and staffing—Infrastructure means more than just computers, routers and wiring. Institutions must plan for the support of their technical environments or the result will be networks and computers that fail and faculty, students, and staff who do not know how to use them even when the equipment is working. A sound infrastructure plan must include permanent, qualified support staff on a full-time basis.

Need for adequate levels of intra-campus and inter-campus connectivity—The California Community Colleges and the California State University (CSU) systems have worked collaboratively to develop and maintain the four-year-old statewide network. This network links the CSUs and the CCCs together into one data/video statewide network. However, the need for access continues to grow exponentially, especially as it relates to Internet access. Already 20 percent of the CCC sites are at capacity as of July 2000. In addition, the individual colleges need to be able to expand their technology infrastructure to take advantage of the systemwide backbone.

Accessibility for persons with disabilities—In 1998, the Office for Civil Rights of the United States Department of Education (OCR) completed a systemwide review of

[1] GartnerGroup. *CCC Technology II Plan Recommended Strategy, December 1999*. San Jose: GartnerConsulting, p. 38-40 (hereafter cited as GartnerGroup, *CCC Tech. II Plan*).

accessibility for blind and visually-impaired students in the California Community Colleges. The OCR directed that in order to satisfy the requirements of the Americans with Disabilities Act, community colleges must ensure that adaptive equipment and software are not confined to High Tech Centers at the colleges. They must be available for use by students with disabilities throughout the campus (in libraries, computer labs, offices, learning centers, and job placement offices). Moreover, OCR requires that newly acquired or developed software and hardware be designed to be accessible for students with disabilities. Critical information conveyed by graphic elements, such as drawings, must be available in an alternative text-based form that is usable by blind and visually-impaired students. Audio information must be captioned for the deaf and screen layout must be designed so students with learning disabilities can use it.

Technology II Strategic Plan

What has the community college system done to address these technology challenges? [2]

The system and the colleges have been partnering with the state, and with the private sector to meet these challenges. The California Community Colleges telecommunications and technology system was first funded in the 1996 State Budget Act and called the Technology and Telecommunications Infrastructure Program (TTIP). This funding has provided the California Community Colleges with networks and resources that are beginning to meet the needs of faculty, students, and staff, including:

- telecommunications and technology equipment that enable information to be shared between institutions, faculty, students and staff;
- capabilities that help faculty, students, and staff accomplish their tasks better; and
- some human resources technology training.

In particular, TTIP funding has provided the following:

- **Linking of the system** in four major areas:
  - data via connection to the California Community Colleges and California State University network;
  - video conferencing capabilities at each college and district site;
  - dual satellite downlink capability (analog and digital) for each college and district office; and
  - library automation.

[2] GartnerGroup, *CCC Tech. II Plan*, pp. 4-6.

- **The ability to distribute educational video** programming throughout California which is the result of the implementation of a digital satellite uplink site.

- **Pilot testing of value added uses** of the new network and of approaches to training of faculty and staff in distance education and educational technology.

- **Local college improvements** in these areas:

  - upgrade of obsolete technology,
  - instructional network improvements,
  - support for educational uses of technology,
  - expansion of distance learning classrooms, and
  - campus instructional programs.

The California Virtual University serves as a gateway to technology-mediated distance learning courses and programs from the California Community Colleges. It was funded in 1998-99 for $2.9 million, and was designed to work in harmony with the above activities. It is accelerating the development and delivery of distributed learning. It helps colleges to provide a 24-hours-a-day, seven-days-a-week learning environment delivering education to students and training to the workforce anytime, anywhere.

In addition, local colleges have sought to provide technological improvements in such areas as these:

- development and upgrading of instructional computer laboratories;
- some support staffing for laboratories and for faculty training;
- wiring of classrooms to access the Internet; and
- some mobile technology carts and some "smart classrooms."

The colleges have utilized a variety of funding sources in addition to the state TTIP dollars, including:

- apportionment revenue;
- state instructional equipment block grant funds;
- federal grant money;
- local foundation resources; and
- local private sector contributions of equipment and dollars.

Finally, at the system level, the Office of System Advancement and Resource Development and the Foundation for California Community Colleges have worked with the private sector to achieve tremendous cost savings for the colleges through statewide cooperative purchase agreements for purchase of computer hardware and software.

What more is needed to effectively meet the technology challenges?[3]

In spite of the actions noted above, there are serious gaps in the colleges' ability to meet today's technology needs. The Chancellor's Office of the California Community Colleges sought the assistance of the well-respected GartnerGroup in assessing the current state of the system. The GartnerGroup's thorough and detailed analysis is attached (Appendix A), and includes details on the methodology for their investigation.

The gaps identified include these:

- There are significant shortages in the number of computers at many colleges;
- The majority of college PCs are older than three years;
- Few colleges are able to upgrade their computers on a timely or regular basis, which limits the software to which students have access;
- Students must wait in long lines to access open laboratories for doing homework or research on the Internet;
- The level of staff support for assisting students and faculty in using the new technology is sorely limited; and
- Training for faculty and staff does not allow an optimal use of technology.

[3] GartnerGroup, *CCC Tech. II Plan*, pp. 24-25

Technology II Goals: Student Access and Student Success

Based on the analysis, the goals for the system's *Technology II Strategic Plan* are clear:

- **Student Access**—*Promote student access to the California Community Colleges including access to instruction and student support services.*[4]

  Students will be able to progress into and through the college experience more readily with the assistance of information technology. Students will utilize technology for on-line access to college admissions, support services, faculty, classes, and libraries, in a manner that is fully accessible for all students, including students with disabilities. Emerging technologies and learning practices extend and expand opportunities to meet the educational needs of unserved and underserved populations. Faculty will be better able to integrate technology into instruction to provide alternate educational access to students through distance learning.

- **Student Success**—*Promote students' success in their educational and career goals.*

  Students, faculty, staff and administration will be able to utilize state-of-the-art technology to facilitate their communication in classrooms, labs, libraries, learning resource centers, offices, and the workplace and/or the home. Necessary up-to-date adaptive equipment and software will be widely available throughout the college. Faculty will use technology creatively to improve the quality of instruction. They will empower students by permitting greater access to information, and by increasing the variety of learning options. Faculty will be supported by qualified technical staff and training to assist them in promoting student success.

[4] GartnerGroup, *CCC Tech. II Plan*, pp. 20-24.

Student Access Objectives

a. ***Establish a baseline of access to computers for students, faculty and staff that serve them that includes a technology replacement program for computers and related equipment at all colleges.***

Strategy: Establish and support a baseline of technology infrastructure at every college that will ensure that students, full-time and part-time faculty, and support staff have access to computers and related equipment. Establish a target baseline for replacement such that computers are no more than three years old. Appendix C describes the baseline models for PCs for faculty, staff, and students. The models are based on the standards and components recommended in the GartnerGroup report, *CCC Technology II Plan Recommended Strategy, December 13, 1999.*

b. ***Support the development of student services technology applications that have systemwide impact.***

Strategy: Continue to explore, develop and evaluate the best practices from pilot projects such as the Telecommunications Model Applications Pilot Projects (TMAPP) (e.g., On-line Tutorial Support, Universal Internet Access, On-line Counseling and Advisement, Remote Access to Library Information, Electronic Transcript Exchange). These pilot projects will be evaluated to explore mechanisms for colleges to pool resources, reduce duplication, and leverage investments. They will also be evaluated to ensure that projects add value to our students and that the community college system receives a positive return on its investment. Continuation of these projects beyond the 2000-2001 year will be contingent on an evaluation by the appropriate consultative entities, ensuring that projects add value to our students and that the community college system receives a positive return on its investment.

c. ***Provide a baseline suite of student support systems and services that would be available, as an option, for each college.*** [5]

Strategy: Develop and promote on-line systems that give students access to college administration, faculty, classes, and libraries and learning resource centers, in compliance with the requirements for accessibility identified by the Office for Civil Rights. These should include, but not be limited to, applications, registration, educational planning, counseling, tutoring, electronic transcripts, financial aid and access to grades. Develop systems that allow students to remotely register for classes, look up schedules, communicate and collaborate with their instructors or other students, take classes, or find information in

[5] GartnerGroup, *CCC Tech. II Plan*, pp. 16, 23, 29

libraries or on the Internet. These services should meet or exceed those services available through a student visit to the campus. Those systemwide projects that will be implemented in the areas of electronic transcripts, digital signature, college applications, and Web-hosting/data warehousing, will be done on a voluntary basis and will include local components and funding allocations. Continuation of these projects beyond the 2000-2001 year will be contingent on an evaluation by the appropriate consultative entities, ensuring that projects add value to our students and that the community college system receives a positive return on its investment.

Student Success Objectives

a. ***Provide ongoing training for faculty in the use of the information technology tools and provide centralized Web and multimedia hosting sites for all California Community Colleges in one of two course management systems.***[6]

Strategy: Foster a wider variety of instructional approaches by providing faculty access to professional resources:

- Train-the-trainer programs for faculty and on-campus faculty training programs using materials and techniques developed collaboratively with other faculty and instructional designers.
- College faculty trainers who contribute best practices and lessons learned to be shared systemwide through a CCCCO central portal.
- Faculty access to expertise, as needed, of the technology support staff for class development, training, and instructional support.
- Faculty access to an innovation fund for reassigned time to develop courses that use technology.
- Colleges access to course management software and/or server hosting of courses.
- Colleges access to a greater cost reduction with group licensee purchases.
- Colleges flexibility to use any combination of hosting classes.
- Maintaining a foundation for the development and expansion in the use of multimedia Web courses.
- Maintaining a central and separate hosting site with or without the course management software for these courses .

[6] GartnerGroup, *CCC Tech. II Plan*, p. 37

In order to assist the local campus efforts, systemwide resources will include components such as these:

- A searchable database such as online tutorials and courses regarding technology for learning on an as needed basis, readily available to faculty and staff.
- Support to local campus technology trainers by providing fully developed training materials for delivery to their campuses.
- Online academic communities (e.g., discipline and student service related sites) to share resources and discuss issues.
- Instructor-led online and live workshops for faculty and staff involved in distributed education.
- Online needs assessment of training needs.
- Online catalog of distributed education courses at California colleges and universities.

Continuation of these systemwide projects beyond the 2000-2001 year will be contingent on an evaluation by the appropriate consultative entities, ensuring that projects add value to our students and that the community college system receives a positive return on its investment.

b. ***Expand access to multi-media classrooms and student computer labs.***[7]

Strategy: Provide a minimum of 15 multimedia classrooms per 10,000 FTES, to enable the use of multimedia resources to enhance student learning. A prototypical multi-media classroom includes the following:

- Big screen computer projection equipment;
- VCR and laser disk/Digital Video Discs (DVD);
- Dimmable lighting;
- Speakers;
- Overhead projector;
- LAN access;
- Access to library databases and network resources; and
- Internet access.

[7] GartnerGroup, *CCC Tech. II Plan*, pp. 30-31

Strategy: Establish both open and subject matter related computer labs for student access and use where at least 50 percent of the funded Total Cost of Ownership model computers would be assigned to "open" student computer labs. An "open" student computer lab is defined as being available for any students' use to conduct general computer related tasks without regard to any specific subject matter i.e., conducting on-line research for a paper, word processing, participating in student class based on-line discussions, and submitting homework electronically.

Strategy: Provide instructional support for students in the open environment appropriate to the number of "Student Computer Lab Hours." A computer lab with 4 computers available 8 hours per day has a total of 32 "Student Computer Lab Hours."

c. ***Establish and support a baseline of technology infrastructure at every college that will ensure that all students, regardless of disabilities, will receive the benefits from such technology in their student services and instructional programs.***

Strategy: Support equality in the educational experience of students by providing both the adaptive computer technology and faculty/staff training needed to assist students with disabilities. Ensure that technology is available for students with disabilities at open and instructional labs and classrooms, libraries and learning resource centers commensurate with the numbers of students with disabilities in the general student population. (Ten percent has been used as a general estimate.) Also, all newly developed or purchased software and hardware should, to the maximum extent possible, be designed with accessibility in mind. The Chancellor's Office High Tech Center Training Unit will continue the mission of training and support for community college faculty wishing to acquire or improve teaching skills, methodologies, and pedagogy in Assistive and Instructional Computer Technology.

The High Tech Center Training Unit will continue to carry out extensive research, testing and evaluation of new and emerging software and technologies of potential benefit to persons with disabilities. The High Tech Center Training Unit will also continue to provide consultation on the appropriateness and accessibility of software and hardware, using both electronic and on-site visits to assist colleges.

d. ***Improve faculty and student access to automated library and learning resources including electronic information databases and administrative services.***[8]

[8] GartnerGroup, *CCC Tech. II Plan*, pp. 23, 30

Strategy: Provide access to information, regardless of format or user location, through continued development of library services and systems that will foster access to systemwide information resources, enabling the colleges and the system to move toward a virtual library and learning resources program:

- Provide for a baseline of continued maintenance of the library automation investments made in Technology I.
- Facilitate the development of a network of virtual catalogs for access by college students, faculty and staff. This could be done in unison with the Library of California and other initiatives in the library community.
- Establish an equitable means for colleges to participate in resource sharing of information resources that are not in a digitized format.
- Foster access to and delivery of core information resources and electronic resources through cooperative or consortium purchasing.
- Provide access to Library and Learning Assistance programs for disabled students, including hardware, software, workstations, networks, maintenance, training and upgrades.

e. ***Develop a centralized Web-based resource center for materials, resources and processes with full faculty access to support the best practices in curriculum and instruction.***[9]

Strategy: Using the appropriate consultative entities, the On-line Curriculum and Instruction Resource Center project will be evaluated. Based upon the lessons learned and conclusions reached about the value of these systemwide resources in support of local campus efforts, the Chancellor's Office will determine whether to continue to provide ongoing leadership and oversight of an On-line Curriculum and Instruction Resource Center for:

- centralized materials, resources and activities with selective search and retrieval, and procedural uniformity;
- immediate, real time access to information and resources;
- the ability to track the status of any materials submitted by the field;
- references for model practices, such as model course of study outlines;
- best practices and the dissemination of information and new ideas;
- easy access to grants information, grant abstracts, progress reports and final reports;

[9] GartnerGroup, *CCC Tech. II Plan*, p. 33

- the ability for Chancellor's Office to identify and update all directories; and
- the ability to inform colleges about statewide committees and workgroup activities by providing a central depository of agendas, meeting minutes, and reports.

f. ***Integrate technology into college offices and support areas to ensure that staff have the tools required to deliver services to students and faculty efficiently and effectively.***[10]

Strategy: Ensure support staff members have access to the latest equipment and software to enable them to enhance student learning by creatively applying those tools in their work.

- Systemwide training programs that work in collaboration with local training efforts that enable staff to best utilize the technology provided in above recommendations.
- Train-the-trainer programs and on-campus training programs using materials and techniques from these programs.
- Technology support staff for administrative application development, training, and technical support.
- College technical support staff with expertise in identifying appropriate technologies to encourage student learning including, the development of student services and administrative applications.

g. ***Improve and maintain systemwide networks to support telecommunication needs of the system; develop and support a technology planning guide and fund the local development of technology plans.*** [11]

Strategy: Based upon the ongoing evaluation of systemwide projects, maintain and expand those networks, services, and programs that provide added value to colleges and produce cost efficiencies due to leveraging size and volume. This ongoing evaluation will ensure that these services add value to our students and that the community college system receives a positive return on its investment. Provide guidelines for local planning and seed funds to the colleges to assist in their planning efforts.

- Maintain and expand the capability of a systemwide network.

[10] GartnerGroup, *CCC Tech. II Plan*, p. 37
[11] Ibid., pp. 29, 32

- Maintain and expand the services and programs of the CCCSAT to deliver educational programming to students throughout the state.
- Maintain and expand the statewide collaboration services for audio/data conferencing to support teaching and learning, as well as shared governance.
- Revise guidelines for local colleges to develop technology and telecommunications plans so they may support the teaching and learning of students.
- Fund the implementation of local technology plans.

h. ***Establish a new leadership role in the California Community Colleges Chancellor's Office to carry out the new body of work and expectations that are defined in this Tech II Plan.***[12]

Strategy: To ensure that the goals of student access and student success are fully realized throughout the system, this new statewide leadership, in conjunction with appropriate system constituencies would be responsible for establishing the appropriate policies, processes and procedures to implement the *Technology II Strategic Plan*. Also, the systemwide administration would coordinate all of the technology initiatives and plans in the agency. It is critical that this new leadership role be defined and staffed in a way that recognized the primacy of the student-oriented goals of this *Tech II Plan* and the educational role of the Chancellor's Office.

This new leadership role should be at a senior management level, and provide leadership for information technology including these specific functions:

- Coordinate all technology-related initiatives within the Chancellor's Office, including the *Technology II Strategic Plan*.
- Monitor, research and disseminate best breed of tools for hardware, software, Internet services and networking in order to advise the colleges.
- Work with the Foundation in the procurement process to secure contracts on behalf of the system to acquire current technology under cost effective terms.
- Ensure that the educational mission of the Chancellor's Office is well served by the agency's technology initiatives.

Evaluation is a key component to ensure the success of the *Technology II Strategic Plan*. The evaluation of projects, in particular, should include an analysis of the

[12] GartnerGroup, *CCC Tech. II Plan*, p. 9

technical architectures to ensure that the underlying technologies are sound and that they are compatible with future technological directions. This new leadership role, in conjunction with the Telecommunications and Technology Advisory Committee (TTAC) and other appropriate advisory entities, will establish suitable evaluation designs and processes, include providing for an external evaluation process where indicated. The critical issues to be addressed in the evaluation processes are the following:

- What are the metrics for evaluation as they relate to a specific type of project and/or technology?
- Is the project effective at the systemwide level?
- Is the structure of the project appropriate?
- What is the added value that the projects provide to the community college instructional programs and support services for students?

Cost to Implement the Technology II Strategic Plan [13]

When educational institutions acquire computer hardware and software, they generally do so without factoring in the costs to support the equipment and infrastructure. As a result, there is often a lack of support to maintain, repair and improve performance of the equipment, as well as a lack of staff for training faculty, staff, and students. This creates delays and inefficient use. The Total Cost of Ownership (TCO) funding concept assumes a relationship between computer hardware/software and support. It is a method of determining the full cost associated with owning and using computers in an educational environment.

The GartnerGroup research shows that the initial cost of hardware and software represents only 30 percent of the TCO. GartnerGroup and the Telecommunications and Technology Advisory Committee (TTAC) worked at length to determine the TCO model appropriate for the community college environment. *Appendix A* provides more detail on the TCO model, including the TCO model components and the cost associated with them.

The cost estimate for the technology using the TCO model (Appendix B) is **$3,506 per PC.** Therefore, a TCO computer is one that is funded at a level of support that corresponds to the 19 elements of the TCO model. The TCO model is designed and constructed to be reviewed and analyzed on a continual basis reflecting the ongoing changes and costs as they relate to equipment, software, training, and support personnel. The TTAC will review the model annually to determine adjustments to it as appropriate. Appendix C describes the PC baselines models for students, faculty, and managerial and classified staff.

[13] GartnerGroup, *CCC Tech. II Plan*, pp. 16-17

This *Technology II Strategic Plan* provides a baseline level of technology for students, faculty and staff, including these sorts of features to support the goals of student access and success:

- A ratio of 1 computer for every 20 students;
- Computers for all full-time faculty, adequate access for all part-time faculty, and computers for appropriate administrative and support staff;
- A replacement rate of once every three years for computer replacement;
- Access for students, faculty and staff to printers, the local area network, office and virus protection software, and other key information resources, e-mail, and the Internet;
- Disabled accessible computers at ten percent of all workstations;
- Support staffing for both technical backup and direct support for students and faculty; and
- Ongoing training for faculty and staff.

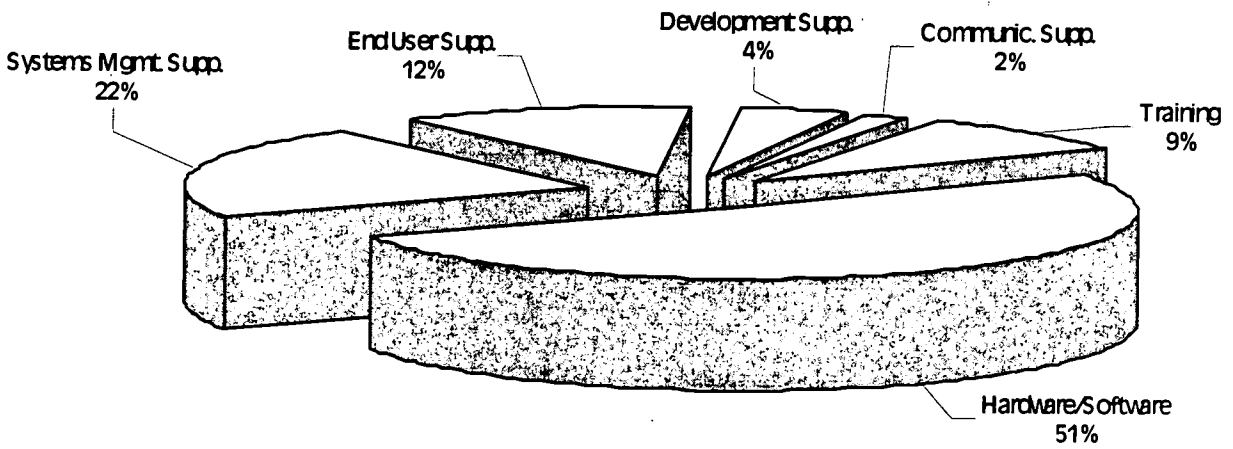
The TCO for the California Community Colleges is much lower than the TCO average for the Information Technology (IT) industry of $5,706. The GartnerGroup identified several reasons for this difference:

- The vendors heavily discounted the hardware and software for the CCCs;
- The support levels are lower than the IT industry;
- The salaries of support staff have, historically, been significantly lower than average. This is explained by the CCC's pattern of hiring entry-level IT staff due to budgetary constraints; and
- Most campuses can be classified as only a moderately complex environment, thus not necessitating the same high-end technology required in industry.

While the TCO may seem too low and may not be ideal from an industry point of view, the implementation of this proposed model for funding and budgeting represents a significant improvement over the current state in the California Community Colleges.

The following graph and table shows the relationship among the various TCO components.

Graph 1 [14]
TCO Components



TCO Components	Cost	Percent of TCO Cost
Hardware and software	$1,794	51%
Systems management support	762	22%
End user support	417	12%
Development support	148	4%
Communications support	60	2%
Training	325	9%
Total	**$3,506**	**100%**

Table 1 describes the various costs associated with the Technology II goals and objectives. It is composed of 13 line items, one for each of the objectives in this *Tech II Plan*. Identified below is the basis for each of those cost estimates.

- Student, faculty and staff access to computers:
  - Student—based on a ratio of 1 computer for every 20 FTES, one third of the total number of computers needed will be distributed per year;
  - Faculty—one TCO computer per full-time faculty and appropriate access to TCO computer by part-time faculty at a 1:3 ratio; and
  - Staff—one TCO computer each for 80% of staff.

[14] GartnerGroup, *CCC Tech. II Plan*, pp. 17-20

- The funding model for instructional support is based on the optimal or most cost effective use of computers to meet instructional objectives as follows:
  - Assuming 150 TCO computers at an average college;
  - 100% of the 150 computers are available for 14 hours per day, 6 days a week;
  - 150 computers optimally used at 14 hours per day would generate 2,100 Student Computer Lab Hours per day. Costs for instructional support in labs are based on an assumption of 1 full-time staff (FTE) per 30 workstations or 210 Student Computer Lab Hours per shift, 420 computer lab hours per day. The cost for each FTE is assumed to be $23,000 per year plus 25% benefits for a base of $28,750 per year per FTE. The Total Cost of Ownership derived from instructional costs for workstations to be used by students is thus $1917 per workstation per year, or $57,500 per student lab per year. The staff necessary to optimally utilize 150 computers would be 5 FTE per shift or 10 FTE per day. In other words, 150 computers, or 5 labs, staffed by 1 person per shift per lab would yield a total cost of $287,500; and
  - Used at this optimal daily rate, and assuming 1 computer per 20 students, in the first year of implementation (2001-2002) each student would have access to a computer on an average rate of about 45 minutes a day; in the second year of implementation (2002-2003) each student would have access to a computer on an average rate of about 1 hour 30 minutes a day; and in the third year of implementation (2003-2004) each student would have access to a computer on an average rate of 2 hours and 15 minutes a day.

- Instructional support staff cost:
  - Instructional staffing costs in the table increases each year for the first three years, paralleling the increase in numbers of workstations in student labs. Any increases in staff costs after the third year of the funding model are driven by one or a combination of the following: increased number of Student Computer Lab Hours, increased usage of individual computers, and/or increased numbers of computers.

- Local planning costs:
  - Local planning costs are calculated at $25,000 per site.
  - The amount does not address the full cost of planning.
  - This amount provides assistance to districts and colleges in planning the local implementation of telecommunications and technology.

- Other cost items:
  - The remaining 9 line items are derived from a variety of factors including feasibility studies in the areas of electronic transcripts, digital signatures, on-line curriculum resource centers, and data warehousing, as well as annual expenditure plans and fiscal and program reports from colleges.
  - Cost is derived from cooperative purchase agreements for library database resources, library automation maintenance contracts as well as agreements associated with the maintenance and expansion of the statewide network.
  - Training costs in the Faculty and Staff Technology Training Fund are derived by a formula using the number of faculty and staff FTE; a base to protect small colleges, and the total amount funded in 2000-01 is $14,000,000.
  - Project specific costs are determined by the resource needs associated with the detailed workplan required to accomplish the targeted goal.

Table 1
Cost to Implement the Technology II Strategic Plan[15]

	Year 2000-2001	Year 2001-2002	Year 2002-2003	Year 2003-2004	Year 2004-2005
Goal: Student Access					
a. Establish a baseline of access to computers for students and faculty and staff that serve them that includes a technology refresh program for computers and related equipment at all colleges.					
Technology for Access (Faculty)	$0	$1,931,806	$2,975,998	$3,657,143	$3,868,830
Incremental Cost	**$0**	**$1,931,806**	**$1,044,192**	**$681,145**	**$211,687**
Technology for Access (Students), including Disability Access (Ratio-1:20 FTES)	$3,962,542	$51,955,491	$77,343,693	$81,213,160	$85,273,809
Incremental Cost	**$3,962,542**	**$47,992,949**	**$25,388,202**	**$3,869,467**	**$4,060,649**
Technology for Access (Staff)	$0	$5,153,833	$8,022,219	$8,423,270	$8,878,034
Incremental Cost	**$0**	**$5,153,833**	**$2,868,386**	**$401,051**	**$454,763**
b. Support the development of student services technology applications that have systemwide impact.					
TMAPP Grants	$0	$0	$700,000	$700,000	$700,000
Incremental Cost	**$0**	**$0**	**$700,000**	**$0**	**$0**
c. Provide a baseline suite of student support systems and services that could be available at each college, i.e., common application, electronic transcripts, digital signature, data warehousing, on-line registration, and Web hosting.					
Student Services support systems	$200,000	$7,196,720	$4,469,205	$4,919,391	$5,017,641
Incremental Cost	**$200,000**	**$6,996,720**	**($2,727,515)**	**$450,186**	**$98,250**
Goal: Student Success					
a. Provide ongoing training for faculty in the use of information technology tools.					
Faculty training programs/initiatives	$10,400,000	$12,900,000	$15,900,000	$15,900,000	$15,900,000
Incremental Cost	**$10,400,000**	**$2,500,000**	**$3,000,000**	**$0**	**$0**
b. Expand access to multi-media classrooms student computer labs.					
Multi-media Classrooms	$0	$6,000,000	$6,000,000	$6,000,000	$6,000,000
Incremental Cost	**$0**	**$6,000,000**	**$0**	**$0**	**$0**
Instructional support in student computer labs	$0	$12,305,000	$25,181,303	$38,628,909	$38,628,909
Incremental Cost	**$0**	**$12,305,000**	**$12,876,303**	**$13,447,606**	**$0**

[15] GartnerGroup, *CCC Tech. II Plan*, pp. 17-19

Table 1 *(Continued)*

	Year 2000-2001	Year 2001-2002	Year 2002-2003	Year 2003-2004	Year 2004-2005
c. To ensure that all students, regardless of disabilities, will receive the benefits from such technology in their student services and instructional programs.					
Access to Print Information	$11,577,716	$10,646,716	$10,646,716	$10,646,716	$10,646,716
Incremental Cost	**$11,577,716**	**($931,000)**	**$0**	**$0**	**$0**
d. Improve faculty and student access to automated library and learning resources including electronic information databases and administrative services.					
Automated library/ learning resources, i.e., databases, remote access.	$4,000,000	$31,882,800	$38,917,800	$34,417,800	$34,417,800
Incremental Cost	**$4,000,000**	**$27,882,800**	**$7,035,000**	**($4,500,000)[16]**	**$0**
e. Develop a centralized Web-based resource center for materials, resources and processes with full faculty access to support the best practices in curriculum and instruction.					
On-line Resource Center	$500,000	$1,200,000	$900,000	$900,000	$900,000
Incremental Cost	**$500,000**	**$700,000**	**($300,000)[17]**	**$0**	**$0**
f. Integrate technology into college offices and support areas to ensure that staff have the tools and training required to deliver services to students and faculty efficiently and effectively.					
Staff tools/training	$7,000,000	$7,848,000	$7,848,000	$7,848,000	$7,848,000
Incremental Cost	**$7,000,000**	**$848,000**	**$0**	**$0**	**$0**
g. Improve and maintain systemwide networks to support telecommunication needs of the system as well as develop and support a technology planning guide and fund the local development of technology plans.					
Systemwide networks and planning	$21,137,458	$27,637,458	$25,033,054	$25,033,054	$25,033,054
Incremental Cost	**$21,137,458**	**$6,500,000**	**($2,604,404)[18]**	**$0**	**$0**
h. Expand and organize the appropriate administrative structure in the Chancellor's Office, including the establishment of a senior level management position					
Systemwide Administration	$0	$381,498	$381,498	$381,498	$381,498
Incremental Cost	**$0**	**$381,498**	**$0**	**$0**	**$0**
Annual Total	**$58,777,716**	**$117,039,323**	**$224,319,486**	**$238,668,942**	**$243,494,291**
Annual Incremental Total	**$27,877,716**	**$118,261,607**	**$47,280,164**	**$14,349,455**	**$4,825,350**

[16] Cost decrease for the automated library/learning resources activity by $4,500,000 due to one time cost associated with hardware, software, and consultants that are not required in subsequent years.
[17] Cost decrease for the On-line Curriculum and Information Resource Center by $300,000 due to one time cost associated with hardware, software, and consultants that are not required in subsequent years.
[18] Cost decrease for systemwide networks and planning, by $2,604,404 due to one time cost associated with hardware, software, and consultants that are not required in subsequent years.

Funding the Technology II Strategic Plan [20]

Background

Currently, funding for the California Community Colleges occurs within the annual legislative budgeting process with no assured or predictable level of funding for technology initiatives. Many of the system's telecommunications initiatives are large in scale (e.g., data, satellite and video networks) and span several years to implement. Colleges are reluctant to make commitments to permanent IT staff or equipment purchases without multi-year funding. Annual funding is currently handled as follows:

- TTIP funds are appropriated by the Legislature at current baseline level categories within three major areas of use:
  - *Infrastructure*: Data, Video, Satellite, and Library Automation
  - *Applications* (Research and Development):
    - Telecommunications Model Applications Pilots Projects (TMAPP)
    - Telecommunications Systemwide Projects (TSP)
  - *Training*: Human Resources Technology Training Fund and Coordinating Training Center
- The annual Budget Change Proposal (BCP) process is utilized to gain additional funding for the colleges.
- Some TTIP funds are apportioned to specific individual colleges by the Chancellor's Office based on single-year grant projects.

[20] GartnerGroup, *CCC Tech. II Plan*, pp. 46-48

- The individual colleges carry out current technology purchases alone or in collaboration with the Foundation for California Community Colleges negotiated contracts. Cooperative agreements lead to economies of scale, cost reductions, and result in more technology on every college for the same or lower cost. Participation in these blanket purchase agreements is wholly voluntary but requires adherence to established technology standards as approved the Chancellor's Office in concert with the TTAC.

A New Funding Model

A new approach to funding community college technology initiatives is recommended to ensure the success of the *Technology II Strategic Plan*:

- The funding structure must recognize the fact that technology investment yields the expected returns only when it is continuous and evolutionary, not episodic and revolutionary.
- As digital delivery comes to undergird every aspect of community college education, funding for technology development at community colleges must be recognized as an essential part of the permanent baseline budget of the system and its colleges.
- A predictable level of funding is equally critical. Stability encourages the colleges to make the required investments in classified staff, technology tools and vendor support needed to maintain the quality and competitiveness of the community colleges.

Adequate support for improving the efficiency of local colleges' administrative services through the use of technology can have a substantial impact upon an important set of services (e.g., financial, student services, and human resources). While the basic infrastructure for student access and student success is being addressed in this *Tech II Plan*, the issues and questions related to the needs of the administrative system are neither separate nor less important. Quite the contrary, without a viable administrative system infused with technology, the infrastructure for student access and success will not be as effective. The need for local colleges to have their administrative services automated must be a part of future funding in the California Community Colleges.

The *Tech II Plan* does address some elements of administrative systems. The total of line items, student services support systems (Table 1–Cost to Implement the Technology II Strategic Plan, Student Access C) and automated library/learning resources, i.e., databases, remote access (Table 1–Cost to Implement the Technology II Strategic Plan, Student Success C) is $175,439,158. This represents 18.3 percent of the total cost of the *Tech II Plan*.

Other than those identified above, inclusion in this *Tech II Plan* of the cost of the administrative systems for the financial, student services, and human resources areas would have significantly increased the cost. In addition, the sequencing of investment requires addressing other needs first so that colleges are technically ready, and the administrative systems can be put to their most effective use. However, if a college met the standards of infrastructure and access in this *Technology II Strategic Plan* through early local initiatives, it would be beneficial for the colleges' students, faculty and staff for the funds from this *Tech II Plan* to be used to address college administrative systems needs.

Sources for Funding Technology[21]

A review of other state funding methods indicates there are a variety of ways to fund technology developments in higher education. The most common is through the general apportionment process. Others include fees for services, revenue generation efforts, foundation/private fees, state/federal grants, shareable earnings, and tax levied.

This *Tech II Plan* assumes shared responsibility for the funding strategies identified in this report. It is recommended that over the life of the *Tech II Plan*, funding be generated from the following resources:

- New State resources: 80%
- Public/private partnerships: 20%

This implementation strategy would continue the current diverse approach to funding the technology needs of the system while ensuring more sustainable revenues for the community colleges, consistent with the special challenges associated with technology.

New State Resources for Technology

The state funds should be new dollars targeted for technology. The colleges require a substantial infusion of funds in order to meet the growing technological needs of students, faculty and staff. The California Community Colleges would seek collaboration with the Legislature and the business community in establishing a new revenue stream. For example, technology user fees, technology taxes on the information technology industries and increases in state General Fund dollars targeted for telecommunication and technology in the community college could create new technology dollars.

The 1998 data from the national "Campus Computing Survey," conducted by Kenneth C. Green, reveal that more campuses than in previous years of the survey are using

[21] GartnerGroup, *CCC Tech. II Plan*, pp. 46-47

technology user fees to help cover rising IT costs. This year, almost half (45.8%) of the institutions participating in the survey report a mandatory IT fee. In the surveyed community colleges, the annual national IT fees averaged $72, an increase from the previous year average of $55. While recognizing this strategy as an option and a trend nationally, the mission of the California Community Colleges to provide access to all that can benefit from instruction runs counter to this approach. The establishment of student technology user fees was considered as an option but is not in alignment with this mission of access and is not a recommended revenue source for funding this *Tech II Plan*.

Other new state resources could include tax levies on information technology companies, such as an assessment on telecommunications carriers as a part of Public Utilities Commission costs. While state and federal grants may provide brief infusions of funds, they are not considered reliable over the long-term and are not viable sources.

Public/Private Partnerships

State, federal, and industry leaders consider the community colleges a critical player in the economic development of the state. The community college provides technical training and education that support local career market needs. Therefore, it is recommended that 20 percent of the funding for the *Technology II Strategic Plan* come from public/private partnerships. This represents $190,981,460 over the five-year period. The Foundation for California Community Colleges would lead this centralized, system-wide effort to develop partnerships. Partnerships could secure substantial cost savings, and promote donations in kind and in dollars. With such outside help, every public dollar will go farther in achieving the objectives of this *Tech II Plan*.

To contribute to this leveraging effect, the Foundation for California Community Colleges would focus on the development of agreements aligned to components of the TCO model in order to achieve additional savings in the hardware, software, and training areas. Agreements would include maintenance provisions negotiated as part of the equipment price and thereby providing additional opportunities to create savings by bundling equipment and service. As stated earlier, the TCO line items represent 39 percent of the total budget. Significant savings in those parts of the TCO that are driven by items the Foundation for California Community Colleges have included in their cooperative purchase agreement program will have a significant impact on private industry's contribution to the investment in technology.

In preparation for their role in securing the 20 percent funding for the *Technology II Strategic Plan*, the Foundation for California Community Colleges is hiring staff for grant development and increased vendor relationships. This newly-acquired staff will pursue federal and state grants, funding and work to negotiate lower prices for additional cooperative purchases.

The Foundation has already witnessed tremendous economies of scale in the new marketplace generated by technology. Technology costs less as the volume purchased increases. An example is the significant savings being passed on to the system as a result of the bundling of software licenses purchases. Currently, two-thirds of the California Community Colleges previous Microsoft expense is being saved by using the Foundation's negotiated agreements. Using this strategy, the system will be able to produce economies in staffing costs through outsourcing opportunities that would lower training costs along with built-in reductions for materials. The bundling of costs will also be able to provide technical support through maintenance contracts, which allows for the use of capital dollars in an area that normally would have used personnel dollars.

The Foundation is also pursuing agreements with vendors who are providing preloaded software on their equipment, thereby reducing technical support costs. Additionally, the Foundation is researching new technologies as they emerge that will provide new opportunities for additional cost reductions and savings.

In addition to cooperative purchase agreements, the Foundation for California Community Colleges and the System Advancement and Resource Development Division of the Chancellor's Office would pursue cash contributions and other endowment gifts that would contribute to the amount to be derived from public/private partnerships.

Continuation of the Current Commitments of Colleges to Technology

California's community colleges are already investing substantially in telecommunications and technology, but they are unable to do enough. The California Community Colleges currently report expending over $73,000,000 per year. Colleges make yearly contributions to the cost of technology in such areas as these:

- development and upgrading of instructional computer laboratories;
- some support staffing for laboratories and for faculty training;
- wiring of classrooms to access the Internet;
- some mobile technology carts and some "smart classrooms"; and
- redesign of curriculum to reflect the use of Information technology in instructional delivery.

In addition to state TTIP dollars, the colleges have utilized a variety of other funding sources:

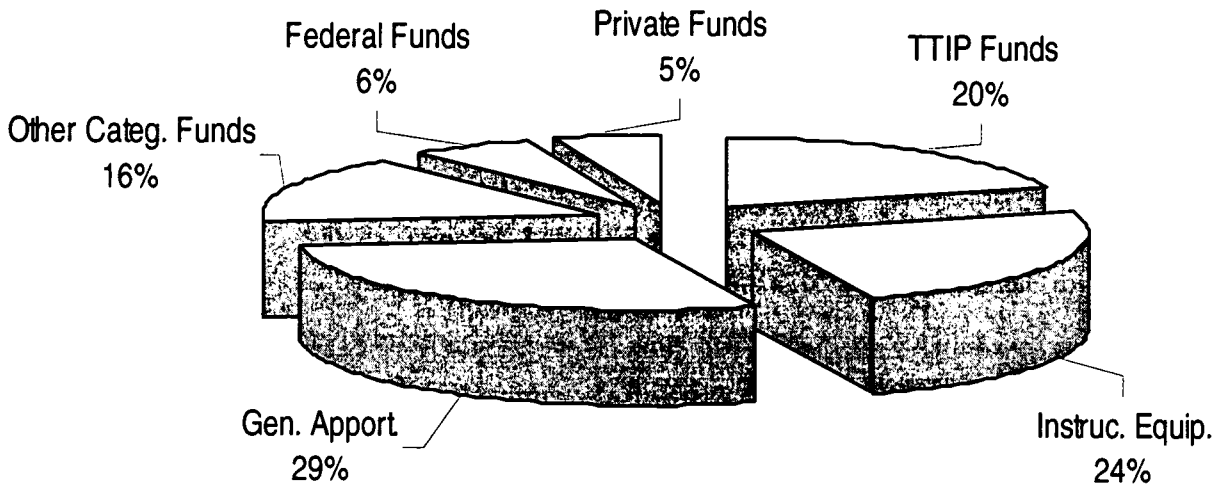
- apportionment revenue;
- state instructional equipment block grant funds;

- federal grant money;
- local foundation resources; and
- local private sector contributions of equipment and dollars.

It is expected that they would continue these contributions, which would then be augmented from the other two sources described here.

The following graph and table describe college expenditures on technology and the funding sources in their 1998-99 Fiscal Year TTIP Expenditure Reports.

Graph 2
California Community Colleges
Total Expenditures for Telecommunications and Technology
Fiscal Year 1998-99



Funding Area	1998-1999 Fiscal Year Funds	Percent of Total Technology Expenditure
TTIP Funds	$14,668,508	20%
Instructional Equipment	17,656,551	24%
General Apportionment	21,231,511	29%
Other Categorical Funds	11,406,341	16%
Federal Funds	4,187,523	6%
Private Funds	3,936,375	5%
Total	**$73,086,809**	**100%**

Digital Divide

The Digital Divide is a major challenge for the community colleges. The number of Americans connected to the nation's information infrastructure is soaring. Nevertheless, the National Telecommunications Infrastructure Administration report, *Falling through the Net II: New Data on the Digital Divide, July 1998,* finds that "a digital divide still exists and, in many cases, is actually widening over time. Minorities, low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that lack access to information resources." This *Tech II Plan* will address this challenge by increasing student access to computers on campuses and pursuing a variety of strategies to improve student access to personal computers.

Although the focus of this *Tech II Plan* is to provide student access to computers on campus, the CCCs are committed to improving student access to personal computers, thereby helping to close the digital divide. There are several ways in which this difficult problem can be approached, and these are being explored at the same time as other possibilities are sought.

- **Low-cost opportunities for computer purchase** (along with software and internet access) must be made available to all community college students, regardless of academic program or income level. This is possible through contracts currently negotiated by the Foundation, and there is additional potential in this arena.
- **The lowest income students must be provided with the means to take advantage of any low-cost purchase opportunities.** Given the major increase in Cal Grant funding now under negotiation major increases in these programs in the near future are unlikely. Also, only three percent of CCC financial aid recipients receive Cal Grant funding, so it is not the best vehicle to deliver computer assistance. A massive grant program (through local assistance or another source) is not likely. True progress will probably come through smaller efforts that each meet a portion of the need for various targeted groups. One source is federal student financial aid. Federal regulations allow computer costs in the student "budget"; eligibility is not a problem for needy students regardless of the academic program or educational goal. Lack of funds to meet the needs of all those eligible is the problem. Some funds may be available, as follows:
    - Loan programs are the only significant source of federal student aid available for such budget items. Many campuses do not participate in the loan programs or have default rate concerns or refuse to market student loans. However, for the right student and at the right price, a loan for computer

purchase could be a wise investment. This would require a payment plan of at least two installments, due to the nature of student loan disbursal.

- Work programs do not restrict student spending of earnings. A few students might be able arrange a purchase on monthly payments from a workstudy position.
- Grant program dollars may be spent on computers. Students should be advised it is permissible to spend their funds on this item.
- At a minimum, each college should be encouraged to advertise the availability of low cost computers to all financial aid recipients accompanied by a handout describing the loan, work, and grant options available at that campus.

- For **vocational students**, there may be some funds available through the Workforce Investment Act if local entities put more funds into the Individual Training Accounts. The regulations regarding student eligibility appear to be broad enough to allow such purchase if it is directly related to the program.
- **Welfare-to-work** support available to Temporary Assistance to Needy Families recipients through the counties does include some book and supply money. For particular vocational programs, there might be some possibility of convincing the Department of Social Services to assist with computer purchase.
- A **partnership with UC and CSU** that targets the information technology needs of the most promising transfer students might yield a small grant or scholarship program from state funds.
- Some business interests might be willing to provide funds to students as **"digital divide scholarships"** that could be used for yet another small groups of students.

The possibility of federal grants will be explored further, given the federal interest in closing this divide. To date, federal funds seemed more targeted toward technology centers rather than individual assistance, but that could change and the California Community Colleges must continue to express the need for funds. Research is needed on the actual extent of the divide and a more precise understanding of the target population. Lack of such research should not deter the effort to provide access to low cost equipment for all California Community College students nor prevent progress on the efforts listed above. Even without specific research in this area it is certain that there is a problem. Some evidence suggests that computer scholarships may be a powerful incentive for retention and/or transfer. Such concepts should also be explored in further research.

Conclusion

The economic success of the State of California relies on the infusion of technology into the California Community Colleges.

> "Technological literacy is a survival skill. No academic discipline can claim to provide lasting knowledge that will insure success in the constantly changing workplace in the information age. There will be even less incentive for students to consume higher education in traditional two-year and four-year chunks, because learning will be required on a continuous basis in every work setting. Students in the information age must be able to plug into learning, whenever, wherever and however it is required for the job. Learning and earning become synonymous in the information age." **Source**: Langhorst, Scott A. 1997 "Changing the Channel: Community Colleges in the Information Age." Community College Review – Winter.

Implementation of this *Technology II Strategic Plan* will permit the California Community Colleges to confront the compelling challenges of serving today's students:

- the explosive use of the Internet as a required occupational and citizenship skill;
- the Digital Divide;
- the necessity for integration of the new technology into teaching and learning;
- the impact of *Tidal Wave II* on demand for college access; and;
- ensuring that technology is accessible to persons with disabilities.

The California Community Colleges will use technology to enable students and communities to be successful in a knowledge-based society by providing universal access to quality learning. Students will have ready access to both instruction and vital student support services and will be supported by state-of-the-art technology in pursuit of their educational and career goals.

Appendix A

GartnerGroup Report

GartnerConsulting

CCC Technology II Plan
Recommended Strategy

Final Report Prepared on Behalf of

CALIFORNIA COMMUNITY COLLEGES CHANCELLOR'S OFFICE

13 December 1999

GartnerGroup

251 River Oaks Parkway, San Jose, CA 95134

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1. INTRODUCTION

1.1 Background and Industry Perspective

1.1.1 Industry Perspective

Higher education continues to face serious problems and issues that could change traditional colleges and universities forever. Executive leadership at many institutions is concerned about the long-term viability of the institutions and increasingly views information technology (IT) as strategic to higher education. Some executives view the concepts of the virtual university and distance learning as the beginning of a "new era" in higher education, while others fear these concepts will spell the demise of their institutions.

With the turn of the century, community college systems are at the precipice of significant growth. This can be the best of times for taking advantage of technology to streamline student service processes, augment teaching practices and build knowledge management systems that effectively assist in management decisions. GartnerGroup has found, however, that many community college systems are struggling with how to operate cohesively, how to define strategy at a statewide level, and how to create funding models that provide a permanent approach to technology and technology support.

In looking at best practices throughout America's statewide higher education system, some themes for success appear. These can be summarized as follows:

- Theme I: Statewide mandates for technology does not work in a district-run academic culture. Districts must be allowed autonomy to meet the needs of the local area. Minimum infrastructure, however, can and should be funded at a statewide level with district-level technology plans defining how each campus will meet these minimum levels. All infrastructure development projects should specifically include funding for qualified IT personnel to manage, maintain and enhance the infrastructure on a long-term basis.
- Theme II: If you build it, they will come. Funding for best-of-breed application studies, Web-based student services, Web-based distance learning infrastructure, procurement contracts and network standards should be established at the statewide level. A core IT team must be established at the state level to build and maintain these programs. Districts can elect to subscribe, or not to subscribe, to these programs at the campus level.
- Theme III: Community college systems should be late adopters of technology. As such, community college systems should not be front runners in developing best practices using "bleeding" edge technology, but should take advantage of lessons learned by those types of institutions. Instead, campus-level experimental projects should be encouraged, but statewide initiatives should not be the focal point in 2000 to 2003.

1.2 BACKGROUND

1.2.1 Technology I

The California Community Colleges (CCC) is the world's largest community college system, with 107 colleges in 72 districts, enrolling 2.3 million students (fall 1999 unduplicated headcount), and spanning a state that is almost 1,000 miles long, from Oregon to Mexico. During the past three years, the CCC system has been implementing the Telecommunications and Technology Infrastructure Program (TTIP). The CCC TTIP was developed as a result of a 1996-97 Strategic Telecommunications Plan through an U.S. Department of Commerce grant. The Strategic Telecommunications Plan identified the need for a statewide telecommunications system to effectively carry out the mission of the CCC system. That mission is to advance California's economic growth and global competitiveness and contribute to continuous workforce improvement. This funding has provided the CCC system with a telecommunications and technology infrastructure that now provides the networks and resources that are beginning to effectively meet the needs of faculty, students and staff.

The TTIP, also referred to now as Technology I, was successful in technologically linking 124 sites including the Chancellor's Office. Technology I had a systemwide focus that linked the CCC campuses together in four major areas: (1) data and Internet access via connection to the 4CNet (the statewide network in partnership with the California State University (CSU) system), (2) video conferencing capabilities at each college and district site, (3) dual satellite down-link capability (analog and digital) for each college and district office, and (4) library automation and electronic information resources.

The TTIP/Technology I had three components: telecommunications and technology infrastructure, telecommunications applications and human resources technology training. First, the goal of the infrastructure component was to develop and implement the required telecommunications and technology networks and resources, including Internet access to effectively meet the CCC's needs. Secondly, the goal of the applications was to enhance student learning and educational outcomes through improved instructional services, improve student services through telecommunications and technology that support the needs of students, and provide better administrative services and systemwide coordination through telecommunications and technology. The goal of training was to provide the coordination, services and resources to enable faculty, students and staff to use telecommunications and technology in the completion of their education and career goals.

The CCC and the CSU systems have worked collaboratively to coordinate the activities that involve the development and maintenance of the four-year-old 4CNet statewide network and other intersegmental activities. The CCC and CSU work in partnership to assure the following network goals: provide bandwidth-on-demand availability; upgrade backbone, when appropriate; design and maintain a robust network for intersegmental communications and shared applications, including instruction and Internet access; implement newly available technologies, where applicable; and respond to the CCC and CSU customers networking needs.

Technology I was funded by the state for three years—1996 to 1997 at $9.3 million, 1997 to 1998 at $18 million and 1998 to 1999 at $28 million, respectively. The program was funded for $28 million in the governor's budget for 1999-2000. The continuation of Technology I efforts will be critical for the community colleges to meet the educational needs of California's population. The challenge is not just to meet the expanding educational needs, but to deliver high-quality education in a manner that achieves student success and ensure that the CCC education is both relevant and timely. The human and physical infrastructure must be enhanced, better organized and better utilized. The newest population estimates of incoming college students, often referred to as "Tidal Wave 2," predict 500,000 new students in the CCC system. Thus, the need continues to grow.

1.2.2 Technology II

The Chancellor's Office established a goal, in the fall of 1997, to develop Part II of a systemwide technology plan with an emphasis on instructional delivery. The Technology II Plan was to be developed in collaboration with the Technology and Telecommunications Advisory Committee (TTAC), a cross-section of the system advisory committees.

During the past two years, working with TTAC, the Chancellor's Office planned for the full utilization of Technology I in conjunction with developing long-range plans for using technology in teaching and learning, increasing student access, improving student support services, and achieving better efficiencies and effectiveness in administrative support.

Recognizing that timely completion of Technology II recommendations was a daunting task, TTAC and the Chancellor's office engaged GartnerConsulting, during the summer of 1999, to develop and complete a second technology strategic plan (hereafter referred to as the Technology II Plan) for the system.

GartnerGroup has developed this Technology II Plan to address the need to maintain the investments made in Technology I, while also refocusing the priorities from intercampus connectivity to intracampus educational-technology development. In creating this plan, GartnerGroup has been working with TTAC, campus presidents, campus (computer) information officers, tenured faculty and student services representatives, trustees, students and the staff of the Chancellor's Office. The proposed outcomes of this study were the following:

- Identify and define strategic directions to support academic and business requirements.
- Develop a statewide IT architecture that will provide a framework for a cost-effective implementation.
- Align the near- and long-term academic and technology requirements.
- Assist in the development of legislation and/or system budget request.
- Identify additional potential sources of funding to accelerate the implementation of the plan.

The Technology II Plan would designate the activities that are necessary to expand the preliminary work of Technology I and help the system prepare for the future. The Technology II Plan picks up from where the Technology I ended. This report will become the new technology plan, one designed to take the system into the next millennium.

The study, itself, conducted between 20 June 1999 and 1 December 1999, was limited by both time and resources. The principal activities of the study were the following:

- Regularly scheduled workshops with the TTAC (eight)
- Scheduled focus groups with key stakeholder groups
  - Students (four)
  - Faculty (three)
  - Trustees (one)
- Scheduled interviews (=/-60)
  - Campus CEOs
  - Campus CIOs
  - Campus CISOs
  - Campus CSSOs
  - Campus Academic Senate representatives
  - Staff from the Chancellor's Office of Instructional Technology
  - Staff from the Chancellor's Legal Office
  - The chancellor
- Campus visits
  - Working with the CCC Office of Instructional Technology and TTAC representatives, GartnerGroup identified 10 campuses considered to be prototypical examples of the size, technical sophistication and demographic composition of the majority of community colleges.
  - Each of these 10 campuses was visited at least once by the CCC/GartnerGroup team.
- Research
  - GartnerGroup Research and Advisory Services (RAS) in higher education
  - GartnerGroup RAS in areas of technology infrastructure
  - GartnerGroup RAS in areas of technology total cost of ownership (TCO)
  - GartnerGroup RAS in areas of technology standards and technology governance
  - Independent GartnerGroup research into the practices of other large state community college systems

- Independent GartnerGroup research into the technology practices of other large state post-secondary education systems
- Independent state, federal and private foundation research into funding and governance models for post-secondary education, in general, and community colleges, specifically.

The results of this study, conducted cooperatively by GartnerGroup, TTAC members and CCC staff members, are contained in the Technology II Plan recommendations presented in this report.

2. Executive Summary

2.1 Executive Summary

The Technology II Plan lays out the framework and funding necessary to maintain and further develop the CCC commitment to the effective use of technology in education. This will result in an enhanced student educational experience and the ever-increasing technology skills required by the California economy.

Technology II is being developed in collaboration with TTAC, a cross-section of the system advisory committees. During the past two years, working with TTAC, the Chancellor's Office has been planning for the full utilization of Technology I. Also, there is a need for the development of a long-range plans for using technology in teaching and learning, increasing student access, improving student support services, and achieving better efficiencies and effectiveness in administrative support. Underlying the plan is the principle that every California adult should have accesses to the CCC (educational opportunities) any time, any place and in any modality required. The plan proposes several related major initiatives:

- Establishing and sustaining a baseline technology infrastructure for all campuses
- Improving access to computers on campus
- Increasing access via computer to meet defined stakeholder objectives in the areas of student services and relevant, marketable job skills
- Expanding opportunities for faculty to use technology creatively to improve the quality of instruction
- Expanding opportunities for faculty to integrate technology and instruction to provide alternate access through distance learning
- Improving the educational experience and the quality of education through creating instructional design and training positions for all campuses to assist faculty in achieving these objectives.

The rapidly expanding use of the Internet, as both a means of communication and an expanded source of information, is vital to CCC students. Internet access is no longer a luxury for CCC students. Increasingly, the ability to navigate and use the Internet will be a required job skill for the majority of California's workers. E-mail has become as pervasive a means of communication today as the telephone or the U.S. mail was as recently as five years ago. Can the community college prosper if it lacks the connectivity and desktop tools to fully participate in this changing educational environment?

The first spending priority of Technology II Plan is to overcome local limitations and ensure equal educational access to all CCC students, by defining, and providing funding to achieve, a minimum baseline for technology infrastructure. Funding received under the Technology II Plan must be leveraged in a way to support the baseline infrastructure level and sustain the investment of Technology I. However, if a campus has met the baseline infrastructure standard, its Technology II Plan allocation can be used to address one of the subsequent priorities identified.

Another primary objective of the Technology II Plan is to provide students with equal and open access to computers. This includes classroom computers for instructional purposes, labs, library computers and dedicated open computers (i.e., computers for purpose of schoolwork, such as writing papers, e-mailing work assignments to teachers, Internet research and access to student services). GartnerGroup assumes that the wide area network (WAN) is to be provided by 4CNet as detailed in the Technology I Plan. Costs for 4CNet are provided by the TTIP. It is important to continue to establish good planning assumptions. Estimates are that Internet access may increase bandwidth requirements by 300 percent or more over the next five years.

Rather than building Web and Internet infrastructure at each campus, GartnerGroup recommends that CCC create statewide initiatives to establish an infrastructure and support model for Web hosting and distance learning. (Note: This will not limit individual campuses from deploying their own curriculum on the Web.) Assuming that 10 percent of students each take one course on the Web, then we have approximately 75,000 students. Further, assume that labs are open 16 hours per work day, making an 80-hour open lab week. Assuming that each student takes one course and spends six hours per week on the Internet, this amounts to an average 75,000*6/80=5,625 simultaneous sessions.

It is important to note that measures of success cannot be addressed until the baseline infrastructure has been established. Establishing measures for success will be a critical outcome of the Technology II Plan and will need to be incorporated into Technology III planning. One clear measure of the success of the Technology II Plan will be the clarification of the role of the Chancellor's Office in the acquisition and management of technology. At minimum, the Chancellor's Office must establish a core group within the CCC staffed for the following activities:

- Research and development (R&D) on best-of-breed tools for hardware, software, Internet services and networking to advise the campuses
- Procurement and contracts to ensure that campuses are able to acquire current technology under the most-advantageous terms
- Clarification of the roles, responsibilities and relationships between the Chancellor's Office, the General Services Administration, the California Director of Information Technology and the California Community College Foundation
- A group within the CCC that will be responsible for coordinating and ensuring maximum benefit from the various educational initiatives under way, including Technology II Plan, the California Virtual University, the Partnership for Excellence, etc. All of these initiatives are valuable but, by coordinating the efforts and expenditures, the limited resources of the CCC could be stretched to do more for the students.

GartnerGroup believes that, if the CCC faculty is going to succeed in integrating technology to improve the student experience, it will need training and IT support to implement the plan. Faculty members will require assistance in finding the right technology tools to achieve the desired outcomes and to learn how to use the tools selected. Further, learning how to use the tools is not limited just to an initial tutorial, but assumes ongoing assistance to ensure that the

faculty member is able to focus on the course content. GartnerGroup research shows that the lack of readily available user help and support is a primary barrier to the successful adoption of new technology and new technology-enabled methods in every professional discipline.

In undertaking this study, GartnerGroup found that the concept of baseline support for technology, together with a formula for TCO, can provide a foundation for determining the scope of technology investment needed to fulfill the CCC mission.

Funding a baseline of technology infrastructure at every campus will ensure that all students, regardless of demographics, will have access to student services and educational benefits of technology during their community college careers. Further, this campuswide infrastructure is required to ensure that all campuses can effectively use the technology delivered by Technology Plan I, in collaboration with other colleges in the CCC and CSU systems.

Campuses that are below this baseline will be required to use their Technology II Plan funds to reach this baseline, before funding any of the second and/or third priorities. Campuses that are at or above this baseline will not be required to use their Technology II Plan funds for further infrastructure expansion. Their funds can be directed to rapid implementation of the second and/or third objectives, as dictated by the individual campus' needs and planned for in their campus-level IT plan.

To carry out these initiatives, the plan proposes a new funding approach. This approach is based on the premise that the State Legislature accepts the following two assumptions:

- Technology investment for the community colleges is not episodic but, once funded, is a permanent increment to campus baseline budgets.
- All campuses will participate proportionately in all technology development initiatives.

Building on the premises that guide the funding strategy, the Technology II Plan proposes that funding be apportioned to all campuses, based on full-time equivalent students (FTESs), and directed toward supporting the identified priorities only. Distribution of the funds by the Chancellor's Office will be based on the following:

- Demonstration that the campus has an IT plan that supports the following statewide strategic educational objectives: access (including students with disabilities), quality, enrichment and administrative efficiency.
- Demonstration (in plan years 2 and 3) that the campus has used the funds allocated to support the stated priorities and can provide measurement data demonstrating progress in meeting these objectives. Suggested metrics are presented in each section of this report.

By establishing objectives (i.e., outcomes) and accepted accountability for the results, GartnerGroup believes the CCC leadership can build a stronger business case to present to the Legislature for initial funding of Technology II Plan. Further, GartnerGroup believes that the Legislature and the Board of Trustees, presented with positive results, will continue to increase funding to support these and related initiatives. Lastly, publication of objectives and results will

build public and private support for continued and expanded investment in educational technology for the CCC.

One of the underlying assumptions in the GartnerGroup approach was that the TTAC members would be inspired to adopt a working style that fostered further intercampus collaboration and support. GartnerGroup believes that maximizing such collaboration is key to achieving better results more quickly and more economically than the traditional CCC model.

In the traditional model, each campus/district acted autonomously and without any mechanisms or incentives to share valuable resources, successful practices and lessons learned. The assumption that a collaborative working environment would develop has not proved to be entirely valid. Some opportunities for collaboration have been identified and are discussed in this report. However, the plan itself is a pragmatic, tactical approach to continued CCC technology planning based on political realities. Nevertheless, it can have a positive impact on the quality and success of the educational experiences of students and teachers at the CCC. Further, GartnerGroup believes that this plan can be the foundation for additional study and intercampus collaboration over the next several years and offers some supporting recommendations at the conclusion of this report.

3. Establishment of a Baseline Technology Infrastructure on all Campuses (Universal Student Access)

3.1 Baseline Technology: Introduction and Background

California's economy is driven by technology—both by the high-technology industry and by the application of technology to carry out general commerce. In California, even more than in the rest of America, familiarity with the use of computers is fundamental to economic access. It is no longer viable to expect CCC students and employees to function without a baseline of networks, hardware and software similar to what the students are confronted with everyday in their workplaces.

Without the development of campuswide networks connected to the CCC WAN (i.e., 4CNET), the intercampus, intradistrict and interdistrict educational and library collaboration envisioned in Technology I cannot be fully realized. To the extent that the promise of Technology I is not achieved, there will be a lessening of the return on this investment.

Another imperative grows from the rapidly expanding use of the Internet as both a means of communication and an expanded source of information. Internet access is no longer a luxury for CCC students. Increasingly, the ability to navigate and use the Internet will be a required job skill for California's workers. As classroom learning becomes a lifelong norm for most workers, the demand to communicate with college administrators, faculty and fellow students in nontraditional ways will accelerate. E-mail has become as pervasive a means of communication today as the telephone or the U.S. mail was as recently as five years ago. Can the community college prosper if it lacks the connectivity and desktop tools to fully participate in this changing educational environment?

The leadership of all of the CCC campuses recognizes the situation. Some colleges have been able to invest in the development of a campus technology infrastructure and provide technology access to faculty and students. However, many others, which could benefit from this technology, have not had the funds to invest or the personnel to implement improved technology infrastructure models. The first spending priority of the Technology II Plan is to overcome local limitations and ensure equal (educational) access to all CCC students by defining, and providing funding to achieve, a minimum baseline for technology infrastructure. Funding received under the Technology II Plan must be restricted to spending to meet the baseline infrastructure level and sustain the investment of Technology I before any other technology initiatives in the plan are undertaken. However, if a campus is at, or above, the baseline infrastructure standard, its Technology II Plan allocation can be used to address one of the subsequent priorities identified.

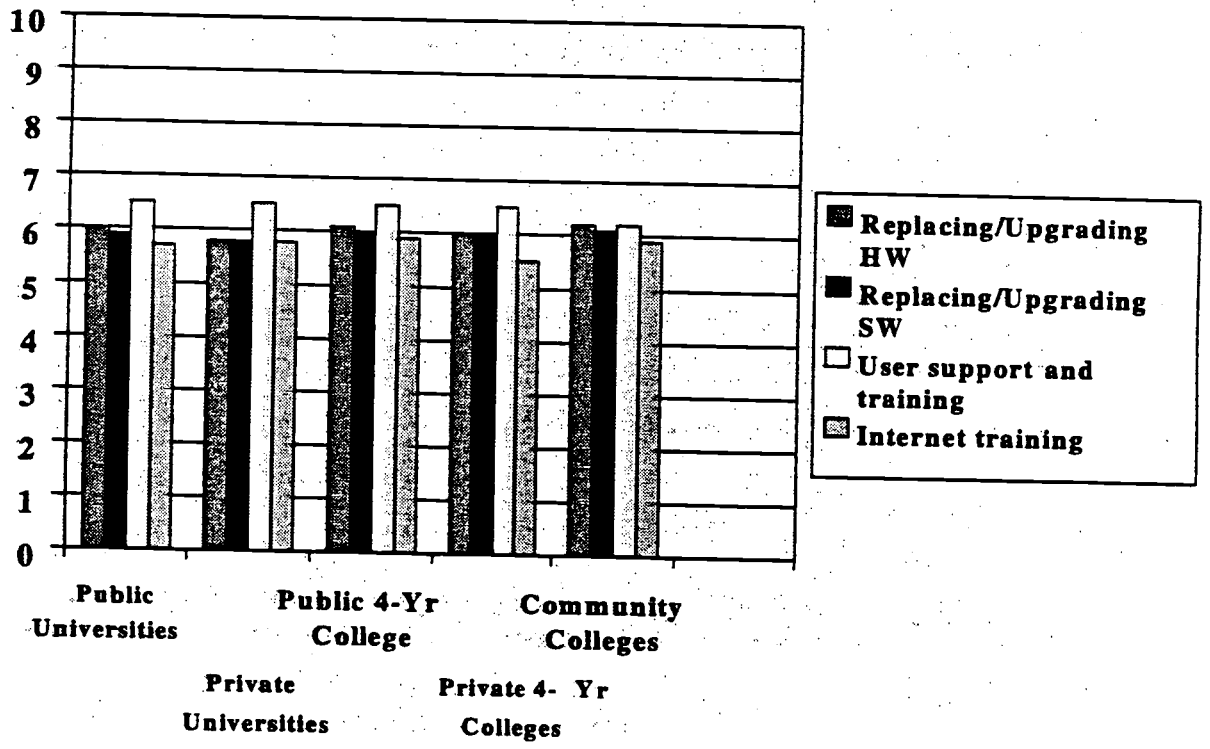
Infrastructure means much more than desktops, routers, controllers and wiring. Any sound infrastructure plan must include permanent, qualified support staff on a full-time, permanent basis. This staff is responsible for the following:

- Implementation of the initial infrastructure model
- Maintenance and enhancement of the environment as tools change and improve
- User training and assistance
- Forecasting usage and planning for infrastructure upgrades, etc.

One of the major limitations in Technology I was its inability to address the need for permanent support staff. As a result, some campuses are unable to deploy the technology that they received under the plan. Some of this equipment continues to be underused because there is no professional IT support staff to set up, install and support the equipment or train the user staff.

Without initial user training and ongoing user support, it is difficult for faculty and staff to learn to use technology tools effectively. Lacking good training and support, the users self-teach, obtain less-than-optimal results and, as a result, often become frustrated. The outcome of this frustration is usually underutilization of the technology and a reluctance to try again when technology is reintroduced.

Ample evidence from the 1998 Campus Computing Survey highlights the rising campus concern about user support issues. Figure 1 reveals that survey respondents identify instructional integration and user support as the top IT challenges confronting institutions over the next two to three years.



Source: GartnerConsulting

Figure 1. Key Technology Concerns

The infrastructure models presented in this report consider the initial cost of acquisition and deployment of technology, as well as the larger TCO issues, including maintenance, enhancement, obsolescence and periodic replacement, as well as full-time user help desk and support services.

3.2 Development of a Model for CCC's Future Computing Infrastructure

The significant and ever-increasing cost of IT requires that the CCC establish rigorous guidelines for technology investment and funding. As a result, GartnerGroup together with the TTAC committee proposes that CCC adopt a baseline target model for each campus.

This baseline model will be used to do the following:

- Establish a minimal standard to ensure equal access for all CCC students.
- Establish three-year targets for IT investment for the purpose of funding, cost projections and budgeting.
- Identify gaps between existing campus IT infrastructure and the target baseline model.
- Establish a measurable program to fully account for campus investment in IT.

3.3 Baseline Model—Campus Target Model Overview

The target model encompasses many variables and was developed in a consensus mode by TTAC members, which include faculty, administrative staff and students.

The baseline model represents minimal requirements for IT to ensure equal access to education for all students. To simplify the concept, the baseline model is broken down into the following eight components:

- Student access to PCs and instructional computer-based labs, instructional information resources and software
- Faculty infrastructure baseline
- Administrative and classified staff infrastructure baseline
- Campus network infrastructure
- WAN
- Internet and remote access (faculty, administrator and student) to campus services and campus Web server
- IT support and staffing
- Training.

The baseline models for IT staffing and training are derived from industry-best practices and CCC-established models. These models are designed to promote and enhance the sustainability of current and future efforts.

3.3.1 Minimum Baseline Support Model and TCO

Two of the major challenges facing higher education institutions in the 21st century are the following: how to effectively support the ever-increasing demand for IT tools; how to keep the technology refreshed and current. These two challenges were identified in the Campus Computing Survey[1] and also mentioned at virtually every campus that GartnerGroup visited through the course of this study.

In the past, colleges struggled to acquire technology and, in particular, PCs for student use, instructional purposes and faculty and administration. The acquisition of these computers was usually funded by grants that only covered the initial capital investment of equipment. Unfortunately, GartnerGroup research shows that the initial cost of hardware and software is only about 30 percent of the TCO of computers. Institutions that are unable to plan for the support of their technical environments and keep them refreshed will end up with obsolete technology. Obsolete technology is costly to support. Furthermore, older and obsolete technology will not be representative of the type of environments that students will likely have to use in the workplace.

3.3.2 TCO Model

Since 1987, GartnerGroup has counseled enterprises to consider all costs associated with computing when making management decisions about desktop and LAN acquisitions, upgrades, support and administration. During this time, GartnerGroup has created and evangelized the concept of TCO to the IT community. As enterprises have begun to address the significant and rising costs devoted to IT infrastructure, the message has gained wide acceptance among IT users. As technology suppliers seek ways of differentiating themselves meaningfully, they too have turned to the TCO model as a means of underscoring their value to the customer.

Used as a management tool as part of an enterprise's annual planning process, the TCO model can become part of a continuous process of measurement, simulation and improvement. Because budget decisions are ultimately based on a set of strategic IT goals, most enterprises must be able to determine various levels of TCO based on the decision being made. By using the TCO model, enterprises can do the following:

- Translate IT cost, staff, budget and other metric information into a TCO "chart of accounts" for each organization.
- Compare the enterprise's actual TCO to typical TCO-based external comparative data. The typical TCO reflects the enterprise's unique business type, size, worldwide location, assets, technology and complexity against enterprises doing similar levels of work.
- Audit the results to highlight strengths and weaknesses in the enterprise's TCO.
- Create a proposed environment or target TCO based on improvements to assets and changes to technology and complexity, and compare the target TCO with the actual TCO.

[1]Kenneth C. Green, Campus Computing Survey, October 1999.

The breakdown of direct and indirect costs used in the GartnerGroup TCO Model include the following:

- Direct (i.e., budgeted) costs: Measure the direct expenditures on IT by an organization (e.g., capital, labor and fees).
- Hardware and software: The capital expenditures and lease fees for servers, client computers (e.g., desktops and mobile computers), peripherals and network components.
- Management: The direct network, system and storage-management labor staffing, activity hours and activity costs, maintenance contracts and professional services or outsourcing fees.
- Support: The help-desk labor hours and costs, performance metrics, training labor and fees, procurement, travel, support contracts and overhead labor.
- Development: The application design, development, test and documentation labor and fee expenditures including new application development, customization and maintenance.
- Communications fees: The intercomputer communication expenses for lease lines, server access, remote access and allocated WAN expenses.
- Indirect (i.e., unbudgeted) costs: Measure the capital and management efficiency of IT in delivering expected services to end users.
- End-user IS: The cost of end users supporting themselves, and each other, instead of relying on formal IS support channels (i.e., peer and self support), end-user formal training, casual learning, self-development/scripting of applications and local file maintenance.
- Downtime: The lost productivity due to planned (i.e., scheduled) and unplanned network, system and application unavailability, measured in terms of lost wages (i.e., lost time).

3.3.3 CCC TCO Model – Approach and Assumptions

GartnerGroup recommends that each client use the GartnerGroup TCO concepts and models and develop its own cost model. GartnerGroup worked with CCC to develop a CCC-specific TCO model (from now on referred to as the "CCC TCO Model"). The model was derived from a midsize campus with 12,000 FTESs. This model will be used as the basic model to extrapolate the cost for the system as a whole.

In order to estimate the TCO for the CCC system (i.e., the CCC TCO Model), GartnerConsulting uses a 12,000-student campus model. In this model, GartnerConsulting was only looking at the direct costs, as the indirect costs cannot be estimated easily. Furthermore, GartnerConsulting did not perform detailed data collection for each category. Instead, we used the GartnerGroup TCO categories and developed a set of minimal baseline assumptions (see Table 1) based on input from CCC executive IT staff and GartnerGroup best practices.

For the particular 12,000-student campus, assuming 15 students per PC (800 PCs) and 300 PCs for faculty and staff, the annual cost $2,891,950 or $2,929 per PC. In addition, 10 percent of the equipment will include assistive technology. The cost for assistive technology is $2,000 per machine. If there were 800 PCs, 80 would need to be adapted, for a total cost of $160,000. The total annual cost comes to $3,051,950. This translates to $236 per FTES.

Subcategory	Cost/Year/ PC	Assumptions	Accum. Costs	Industry Costs
PC hardware and operating system (OS) cost	$550	Acquisition depreciated over 3 years	$605,000	
Assistive technology hardware and software (10% of PCs)	$667	Acquisition depreciated over 3 years	$160,000	
OS and office software licenses	$100		$110,000	
Peripherals	$100		$110,000	
Network operating system (NOS) hardware	$45	1.5 servers	$49,500	
NOS licenses	$20		$22,000	
Switches, hubs and bridges (hardware and software)	$42	$125/port	$46,200	
Wiring	$60		$66,000	
NSM hardware and software	$160		$176,000	
Training	$250		$275,000	$500/yr
Servers (HDW and SFTW for Web services)	$50		$55,000	
Technical staff training	$75		$82,500	
Total Cost			**$1,757,200**	
Direct Costs of Systems Management				
Network and systems admin. (Novel, etc., include wiring staff)	$187	1 staff/300 PCs; (3.66) loaded cost = $45,000/yr + 25%	$206,250	
Technical management	$187	1/500 PCs @ $75K + 25%	$205,250	

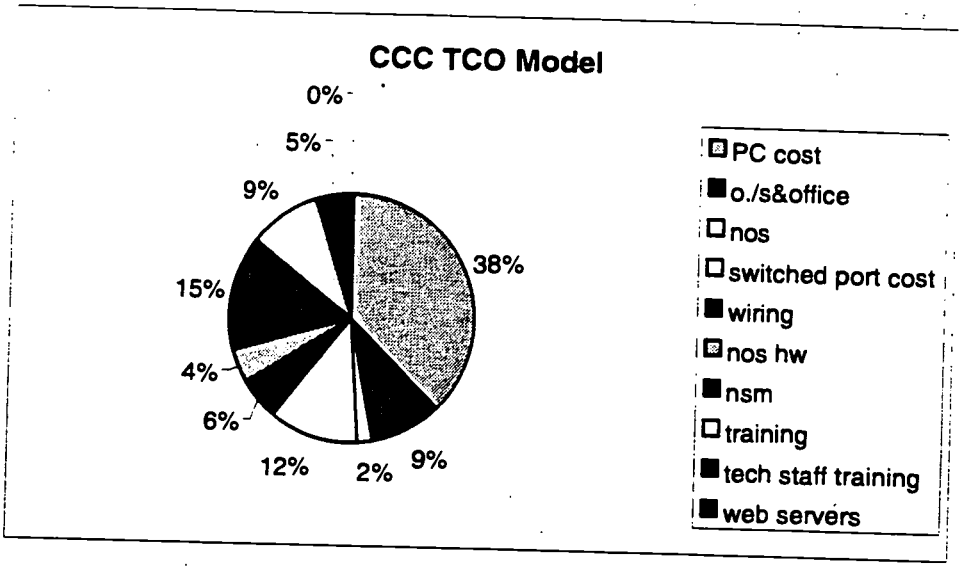
Web administration	$51	1 staff per 12,000 FTESs; loaded cost=45,000/yr + 25% = $	$56,250	
Administrative systems support (Web, user development applications)	$68	1@$60K + 25% = $75,000	$75,000	
		Total Cost	**$543,750**	
Direct Cost of Support				
Level 1 support	$375	1 staff/150 PCs; $45,000/yr + 25% = $56,250/staff	$412,500	
		Total Cost	*$412,500*	
Direct Cost of Development Support				
Application development	$102	2 staff/12,000-FTES campus loaded cost = $45,000/yr/staff + 25% = $56,250	$112,500	
		Total Cost	**$112,500**	
Direct Cost of Communications Support				
Network	$60	$24,000/yr : 1-6,000 FTESs $48,000/yr: 6,000-12,000 FTESs $72,000/yr: 12,000-18,000 FTESs $96,000/yr: 18,000+ FTESs	$66,000	
		Total Cost	**$66,000**	
PC TCO	**$2,929**	**Accumulative Cost**	**$2,891,950**	

*Note: This table does not include printers for assistive technology. The printers are estimated at $4,000 per printer. One printer would be necessary for each lab that provided assistive technology.

Table 1. CCC TCO Model Assumptions

The TCO model chart, shows support at eight hours per day and five days per week. If support were increased to an 18-hour day to cover evening and late-night usage, costs would have to be increased. Evening and late-night usage costs would be less than daytime costs, due to fewer students and faculty. The service level is assumed to be a two-hour response time for classroom and/or critical administrative application and 24-hour response time for noncritical support problems.

The CCC-TCO model (Figure 2) estimates that the annual TCO per campus PC is $2,929. Note, this cost does not include end-user costs.



Source: GartnerConsulting

Figure 2. CCC TCO Model

The CCC TCO of $2,929 is much lower than the industry TCO average of $5,706. There are several reasons for this, including the following:

- The vendors heavily discount the hardware and software for CCC.
- The support levels are lower than the industry as a whole.
- The salaries of support staff are significantly lower than average. This is explained by the CCC tendency to hire at the low-end salary IS staff.
- Most campuses can be classified as a moderately complex environment.

While the CCC TCO may seem too low and may not be ideal from an industry point of view; implementation of the proposed model for funding and budgeting purposes represents a significant improvement over the current state.

3.4 Student Access to Campus PCs

3.4.1 Definition of Student Access

One of the primary objectives of the Technology II Plan is to provide students with equal and open access to computers. This includes classroom computer for instructional purposes, labs, library computers and dedicated open computer (i.e., computers for purpose of schoolwork).

Access to computer technology is becoming a critical for students to be successful in the California workplace.

A new book entitled "Taking a Big Picture Look @ Technology, Learning & the Community College," explores what steps community colleges need to take to prepare students for working in the high-tech marketplace. The book, written by 15 authors and co-edited by Mark D. Milton and Cindy L. Miles, will be published in December or January by the League for Innovation in the Community College. The authors say community colleges need to create a student-centered educational environment that makes every effort to expose students to the latest in relevant technology. Some schools are doing this already by offering distance-learning programs and establishing sophisticated Web sites that allow students to register and pay for classes and generally avoid academic bureaucracies. Also, college presidents are hiring younger, more technology-savvy professors to replace retiring faculty. The League for Innovation surveyed 523 college presidents and CEOs while preparing the book.[2]

Research and surveys show that student use of computers as part of their education and life is increasing rapidly. Computers are becoming part of the syllabus. The 1998 (Kenneth C. Green) survey results illustrates this clearly and includes the following:

- "The percentage of classes using e-mail jumped to 44.4 percent this year, up from 32.8 percent in 1997."
- "One third (33.1 percent) of all classes are tapping into the Internet as part of the syllabus, as compared to one-fourth (24.8 percent) last year and just 15.3 percent in 1996."
- "45.1 percent of undergraduates use the Internet at least once a day."

Already, students use computers for schoolwork. A recent survey [CCC Student Expenses and Resources Survey, 1997-98,California Student Aid Commission] found that the majority of the students (81.1 percent) use computers for their education.

Traditionally, the majority of campuses have attempted to provide students with access to computers through the library or through dedicated "open computer labs." The idea of providing sufficient "open computers" to allow all students minimum hours per week of access to campus computers is becoming less relevant, as a significant portion of students have access to their own PCs. Over time, GartnerConsulting predicts that the majority of students will have access to their own computers and to the Internet, and the need for "open computers" will be replaced with the need for students to access the Internet, and campus computing services, from their own computers.

GartnerGroup and TTAC recommend that campuses establish a program to bridge the gap between those who have access to computers and Internet and those who do not.

[2] Chronicle of Higher Education Online, 25 October 1999.

There are numerous alternatives for bridging this gap:

- Establish effective lease programs to allow students to lease computers while registered on campus.
- Acquire computers and build out open computer labs for general purpose use of computers.
- Increase utilization of dedicated instructional computers to allow students access during nonbusy hours.
- Establish financial-aid programs to allow students to lease or buy computers.

Regardless of the increase in the population of students that own PCs, the need for campus computing will continue to increase. However, the focus shift will be toward using the computers to enhance instruction and the educational experience of the students and to properly prepare the them for the workplace.

The key question for the purpose of this plan is to determine what the ratio of computers to students should be. Developing a deterministic model for each campus is complex and cannot be precisely done at this time, as each campus will vary depending on the following:

- The instructional program developed by each instructor
- Class size
- Course requirement for matriculation
- Student access to a computer outside the campus
- Scheduling of classrooms, instructors and technicians
- Utilization and efficiencies
- Economies of scale
- Geographical distribution.

Therefore, for purposes of the Technology II Plan, GartnerConsulting assumes the baseline in Table 2, which is based on the prototype campuses.

Category		Minimum Baseline Model
A1	PCs for students	2000: 1 PC for every 15 FTESs. 2003: 1 PC for every 10 FTESs. 10 percent of all campus computer systems will be configured with industry-standard assistive computer technology to provide access to students with disabilities.
A2	Printers	Sufficient printing will be available. Costs will be charged back to the students.
A3	LAN access	Each PC will be LAN connected.
A4	Office software	The majority of PC will be equipped with office software. It will be up to the campus to decide whether to use a uniform configuration or a hosted applications model.
A5	Information resources and software	Each PC can access library databases, instructional servers, Web sites and instructional software. Campuses will make every effort to ensure that these resources are operational with industry standard assistive computer technology.
A6	E-mail	Each PC will have Web-based access to the campus e-mail system. Students are required to use an ISP for access.
A7	Internet/intranet access	Each PC is equipped with a browser for Internet access
A8	Virus detection software	Each PC is equipped with anti-virus software.
A9	Access to student services system through Internet/intranet only	Each PC will provide students with Web access to student services.
A10	Refresh rate and currency of computers	PCs and assistive-computer technologies will be replaced on a three-year basis, consistent with industry best practices. The rationale is to reduce TCO by introducing more manageable equipment and refreshing with new software.
A11	PC support infrastructure	CCC campuses will use best-practice approaches to manage their PC population (e.g., ability for remote monitoring and management, electronic inventory of hardware and software).

Table 2. Student PC Baseline Model

3.4.2 Rationale

The proposed student PC baseline model is based on the most conservative of assumptions (i.e., it is assumed as the minimal acceptable baseline). The students' real needs for computing are assumed to be much higher. The proposed number of campus computers represents a minimal baseline to be achieved over the next three years.

The student baseline model is driven by the following factors:

- Equal access requirements
  - Campuses must provide sufficient computers to ensure that students (including those with disabilities) can have the opportunity to learn basic computer skills.

- IT shall be positioned as part of the curriculum and be integrated into the instruction and learning to enhance instruction and student skills (e.g., campuses will make every effort to ensure that these resources are accessible to students with disabilities).
- Instructional resources that directly support student and curricular needs are essential to student success.
- Access to student services (e.g., registration, transcripts, financial aid)
- Students need communication with instructors and each other using e-mail.
- Internet research, access to current information and digital formats.
- Development of reports, term papers and homework assignments.
- Laboratory work, instructional computing needs.
- Sustainability is a primary importance. Evergreening processes and refresh rates must be established.

- Reasonableness: The model must be realistic and achievable within a reasonable budget.
- Best practices from CCC campuses and other higher education institutions.
- Academic and instructional needs throughout the system.

3.4.3 Gap and Impact Analysis

The result from the prototype campuses (Table 3) indicates gaps between available PCs and the minimum baseline infrastructure. This is due to the following:

- While most campuses have adequate PCs for 2000, there are significant shortages at many schools.
- Virtually all of the campuses have a shortage against the 2003 model, which assumes 10 FTESs/PC.
- The majority of campuses have PCs that are older than three years.
- None of the prototype campus had an effective renewal and upgrade program.

	Total Number of Unduplicated Student Headcounts 97-98	Total Number of Credit FTESs 97-98	Open Computers for Students	Instructional Computers	Total Computers for Students	FTESs per Computer
Large Modern Campuses						
Cabrillo	19,509	8,946	102	597	699	12.80
San Diego	22,659	9,221	350	466	816	11.30
Santa Rosa	49,705	15,944	x	x	810	19.68
Butte College	23,314	8,830	170	614	784	11.26
DeAnza	39,504	18,873	176	1,600	1,776	10.63
Santa Barbara City	18,137	10,738	65	515	580	18.51
Pasadena City	41,191	19,891	170	763	933	21.32
Large Inner-City Old Campuses						
East Los Angeles	32,215	13,328	500	500	1,000	13.33
Small Rural or Distributed Campuses						
Cerra Coso	10,508	2,687			100	26.87
Feather River	2,993	1,449	83	15	98	14.79
Sequoia	14,034	7,975	50	563	613	13.01
Midsize Campuses						
Laney	20,177	7,765	76	302	1,468	5.29
Hartnell	13,750	5,674	262	52	314	18.07
Summary		**131,321**			**9,991**	**13.14**

Note: This analysis is based on the most recent student unduplicated headcount data available (1997-98). Unduplicated student headcount for 1998-99 and 1999-00 is trending upward. Thus, the gap depicted here is statistically valid, but actually understates the size of the PC gap as of November 1999.

Table 3. PC Gap Analysis for Prototype Campuses

3.4.4 Recommendations

While most campuses have achieved a certain level of PC for their respective campuses, they need to budget and fund adequate support and ongoing costs for upgrades. GartnerGroup recommends that funding be based on the CCC TCO Model.

Looking at the entire CCC system and the projected growth, the total funding for student PC and associated infrastructure is described in Table 4.

Year	FTESs	Baseline Target for Number of PCs	Incremental Funding and Budget ($2,929/PC)	Proposed Funding and Budget ($2,929/PC)
2000	959,259	63,951		$187,312,479
2001	1,007,222	77,479	+ $39,623,512	$226,935,991
2002	1,057,583	96,144	+ $54,669,785	$281,605,776
2003	1,110,462	111,046	+ $43,647,958	$325,253,734

Table 4. CCC Baseline Cost for Student Computing Infrastructure

3.5 Faculty Access Baseline Model

Category		Minimum Baseline Model
B1	PCs for full-time faculty	One PC for every full-time faculty member.
B2	PCs for part-time faculty	A goal of 25 percent of full-time equivalent faculty (FTEF) over the three years with a minimum of 1/3 in the first year.
B3	Printers	One advanced laser printer to be shared across 50 faculty staff.
B4	LAN access	All PCs will have network access.
B5	Office software	Each PC has standard office software including word processing, spreadsheet and presentation-design software.
B6	E-mail	Each PC has Web-base access to the campus e-mail system.
B7	E-mail for adjunct	Each adjunct instructor will have an e-mail account.
B8	Internet/intranet access	Each PC is equipped with a browser.
B9	Virus-detection software	Each PC is equipped with anti-virus software.
B10	Scanners	There will be one industrial scanner for every 100 faculty members.
B11	Access to administrative systems	Each PC will have access to administrative systems when appropriate (by the end of 2003).
B13	Information resources and software	Each PC should be able to support faculty research of library databases, educational software and course management software.

Table 5. Faculty Access Baseline Model

3.5.1 Assumptions

The following assumptions are made:

- All faculty members need access.
- Faculty includes all faculty as defined by the AB-1725 profile.
- As a starting point, 25 percent of FTEF will be used for determining part-time faculty fulfillment of baseline needs. Each campus can determine how to fulfill the baseline but a minimum of one-third must be funded in the first year.
- Funding will assist in access-level setting for faculty with administration and students.

3.5.2 Rationale

PCs for faculty are crucial at this juncture. All full-time faculty must have access to a networked computer. GartnerGroup found throughout the prototype colleges that the ratio of computers to the total of full-time and part-time faculty is lower than the ratio of computers to administrative and classified staff. In addition, the lack of computers for faculty directly impacts student access to education and the ability of teachers to communicate with students.

3.5.3 Recommendations

While most campuses have achieved a certain level of PCs for their respective faculty, especially full-time faculty, they need to budget and fund adequate support and ongoing costs for upgrades and renewal of the infrastructure. GartnerGroup recommends that funding and budgeting for faculty PCs be based on the CCC TCO Model. The budget model is based on the following assumptions:

- One computer per full-time faculty at a TCO of $2,929.
- The ratio of teaching load for part-time faculty to full-time faculty is 25 percent to 75 percent, or 1-to-3.

Thus, GartnerConsulting calculates the total cost based on full-time faculty and adjusts by a factor of 1.33. Table 6 shows the IT infrastructure cost for faculty over the next four years for the entire CCC. (Note: The table assumes a faculty compound growth factor of 5 percent annually.) Looking at the entire CCC and the projected growth, the total funding for faculty PCs and associated infrastructure is illustrated.

Year	FTEF	Adjusted for Part-time Faculty (Factor 1.33)	Incremental Change in PCs	Baseline Target for Number of PCs	Incremental Funding and Budget	Proposed Funding and Budget ($2,929/PC)
2000	24,788	32,968		1,653		$4,841,637
2001	26,027	34,616	1,648	2,002	$1,022,221	$5,863,858
2002	27,329	36,347	482	2,484	$1,371,778	$7,235,636
2003	28,695	38,175	386	2,870	$1,170,594	$8,406,230

Note: This budget reflects the cost of acquiring and supporting PCs to support both full-time and part-time faculty. No funds are included in this estimate to provide for part-time faculty computing (or office) facilities. Any capital expenditure for part-time faculty facilities would be budgeted for separately by each campus.

Table 6. CCC TCO Budget for Faculty Infrastructure

3.6 Managerial and Classified Staff Infrastructure Baseline

	Category	Minimum Baseline Model
C1	PCs for full-time administrative and classified staff	1 PC for 80% of full-time managerial and classified staff, as appropriate
C2	Printers	One advanced laser printer to be shared between 50 staff.
C3	LAN access	Network access for each PC.
C4	Office software	Each PC has standard office software including word processing, spreadsheet and presentation-design software.
C5	E-mail	All staff members will have Web-based access to the campus e-mail system.
C6	Internet/intranet access	Each PC is equipped with a browser.
C7	Virus detection software	Each PC is equipped with anti-virus software.
C8	Access to administrative systems	Each PC will have access to the administrative system, when appropriate.

Table 7. Administrative and Classified Staff Infrastructure Baseline

3.6.1 Rationale

Historically, most college campuses have established significant infrastructure to support the administrative needs, including a student registration system, human resources and payroll. Managerial and classified staff is defined as academic, classified, professional or other classified staff.

The purpose of an 80-percent ratio is based on an assumption that 20 percent of the staff does not need PC access.

One of the key problems facing most colleges is how to keep those PCs current. GartnerGroup best practices suggest a PC replacement/refreshment every three years. GartnerGroup assumes that all administrative computing costs are funded from the campus baseline budget.

3.6.2 Recommendations

While most campuses have achieved a certain level of PCs for their respective campus staff, they need to budget and fund adequate support and ongoing costs for upgrades. GartnerGroup recommends that funding and budgeting for staff PCs be based on the CCC TCO Model. The budget model is based on the assumption that there is one computer per 80 percent of all full-time equivalent staff at a TCO of $2,929.

Table 8 shows the IT infrastructure cost for staff over the next four years for the entire CCC. (Note: GartnerConsulting assumes a staff compound growth factor of 5 percent annually.)

Year	Admin. Staff	Academic Admin	Classified Staff	Classified Professional	Total	Baseline Target for Number of PCs	Incremental Funding and Budget ($2,929 per PC)	Proposed Funding and Budget ($2,929 per PC)
2000	2,476	1,459	1,459	824	6,218	4,974		$14,568,846
2001	2,600	1,532	1,532	865	6,529	5,223	$729,321	$15,298,167
2002	2,730	1,609	1,609	908	5,484	5,484	$764,469	$16,062,636
2003	2,866	1,689	1,689	954	7,198	5,758	$802,546	$16,950,123

Table 8. Staff PC Baseline Cost Model

3.7 District Network Infrastructure

	Category	Minimum Baseline Model
D1	LAN access	One LAN access point for each campus PC; 10/100 MB Ethernet
D2	Printer access	All printers are LAN-attached.
D3	Classroom wiring (horizontal)	Each classroom will have at a minimum four telephone connections available and 10/100 MB LAN access with a minimum of two locations each providing 2-CAT 5/6 UTP cable connections (RJ 45) and 2-CAT 3 or better outlets (RJ 11)
D4	Offices and public spaces	Offices with a size of 100 sq. ft. or less will have at least one location wired with 2- CAT 5/6 UTP cable connections (RJ 45) and 2-CAT 3 or better (RJ 11). Offices of larger sizes will double this requirement with shared office spaces requiring individual design.
D5	Internet access	At minimum, one T1 circuit per 5,000 FTESs per campus. Connection to the Web must employ some kind of high-speed connection and must be monitored on a frequent basis to ensure maintenance of 75 percent or less during peak usage times.
D4	Other external access	At minimum, one two-way video connection per campus. At minimum , one satellite downlink per campus.
D5	Backbone	Collapsed switched backbone. All servers are centralized. Reasonable redundancy to minimize outages to no more than one hour.
D6	NOS-file and print services	One common network infrastructure (i.e., WAN/LAN) per campus.
D7	Switches	Switches and hubs should be remotely manageable. Each "central building" switch location should include at least one switch capable of gigabit function.
D8	Wiring closets	New buildings shall include wiring closets within 2,000 feet of the farthest classroom and these must be warm, dry, with good lighting and allow access both in front of and behind standard rack-mounts. All wiring closets must include uninterruptible power supplies sufficient to provide at least one hour of backup time.

Table 9. Campus Network Infrastructure

3.7.1 Assumptions

- Planning for infrastructure must be done at the district level.
- Voice will become a part of the network in Technology III.
- When developing wiring plans, take into consideration voice and environmental control for the future.
- Special distributed metro-area networks (MANs) are funded outside the baseline.

3.7.2 Rationale

Campus wiring is very expensive and each campus should have a wiring plan included in its campus strategic IT plan by 1 July 2000. The plan should include anticipated new buildings and increasing bandwidth resulting from expanding Internet usage. Once laid, wiring infrastructure, if properly done, tends to have an effective life of 10 years or more.

3.7.3 Recommendations and Cost Projection

The cost of campus infrastructure is included in the TCO models under student, faculty and administration.

3.8 Classroom Instructional Infrastructure

CCC faculty has expressed a strong need for basic instructional equipment to help enhance teaching and learning. A prototypical multimedia classroom includes the following:

- Big screen computer projection equipment
- VCR and/or laser disk/DVD
- Dimmable lighting
- Speakers
- Overhead projectors
- LAN access
- Access to library databases and network resources
- Internet access.

There are several solutions and alternatives to meet these needs. Representing a range of the high-end vs. low-end solutions, GartnerConsulting can look to some good practices within the CCC system, including the following:

- Cabrillo College has installed 15 multimedia classrooms based on the above configuration.
- San Mateo has developed a low-end solution by employing a mobile cart loaded with a PC, projection equipment, wireless communication devices, etc.

The cost for a typical high-end multimedia classroom for 100+ students is approximately $21,000 (or $7,000 per year).

The baseline number for a classroom is for a high-end, large, immovable scenario. Classroom instructional infrastructure assumes a large classroom for 45 to 60 students. A smaller classroom would not need a ceiling-mounted projection unit or large screen, and the lighting system could be less robust. Equipment on roll-about carts shared with other such rooms might cost $15,000 to $18,000 (or $5,000-$6,000 per year).

Category	Cost/Total
Projection unit	$7,000
Cable 50 to 100 feet	$500
High-quality speaker	$500
Power projection unit and mounting (ceiling)	$1,000
Big screen	$300
Small mixing panel	$350
Customer-built cart	$750
Mac and PC	$4,000
Lighting system	$6,000
VCR	$300
Total	$20,700

Table 10. Baseline Multimedia Classroom

Following the lead examples of Cabrillo and San Mateo, GartnerConsulting suggests a minimum of 15 multimedia classrooms per 10,000 FTESs, or approximately 750 multimedia classrooms statewide. If we assume five high-end classrooms at $21,000 each and 10 medium/low-end classrooms as $12,000 each, the total cost is $225,000, or equivalently, $18 per FTES.

At a CCC statewide level, this amounts to approximately $18 million in multimedia classrooms or approximately $6 million per year, assuming a straight-line three-year depreciation.

3.9 Wide Area Network

Category		Minimum Baseline Model
E1	Campus WAN access	Leased line and T1/T3 access
E2	CCC systemwide WAN	Assumed to be 4CNet

Table 11. Wide Area Network

3.9.1 Rationale

GartnerConsulting assumes that the WAN will be provided by 4CNet as detailed in the Technology I Plan. Costs for 4CNet are provided by the TTIP. It is important, however, to continue to establish good planning and sound business assumptions. Estimates are that Internet access will increase bandwidth requirements by 300 percent or more over the next five years. The WAN needs to be ready to meet this demand.

3.10 Internet and Remote Access to Campus Services and Campus Web Server

Category		Minimum Baseline Model
F1	Student access—e-mail	Students will either access Internet through a campus computer or through private signup with an ISP. All e-mail access from the outside will be based on browser technology.
F2	Student access—student services	Access to e-mail via Internet, Web access to student services.
F3	Access for distance learning	20 percent of classes will have an Internet component in 2000. This is expected to increase up to 35 percent by 2003. Aside from remote site classes, students in classes involving the Internet are assumed to have their own computers and have access through an ISP. Distance education resources will be designed to provide for access by students with disabilities.
F4	Employee access	Access to E-mail via Internet: No access to administrative system via Internet or dialup access

Table 12. Remote Access Baseline Infrastructure

3.10.1 Assumptions

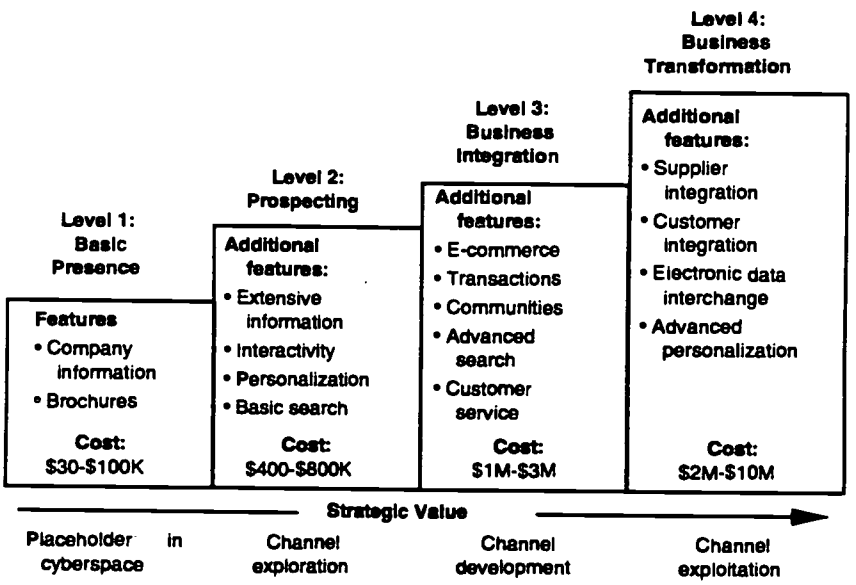
The goal is access for students primarily through the Web for grades, transcripts, application, registration, education planning, course scheduling and financial aid. Internet access is driven by the following:

- Faculty needs
- Distributed learning
- E-mail
- Student services.

There will be no remote-access infrastructure necessary to support distance learning through campus dial-up equipment. All Internet access will be through established ISPs only (4CNet can act as a primary ISP for campuses). In order to establish a reasonable benchmark for the remote access infrastructure, consider the following assumptions:

- The majority of the CCC campuses are pursuing Web/Internet access to student services systems.
- Web/Internet-based access to student services systems must be designed to work with assistive computer technologies used by students with disabilities.
- They are also developing Internet platforms in support of distance learning.

The costs of these environments (Figure 3) tend to be higher than initially estimated by the industry. On the other hand, moving toward a self-help environment and off-loading administrative staff may allow CCC to grow incrementally and still limit hiring of additional staff.



Source: GartnerConsulting

Figure 3. Cost of Internet Environment as a Function of Sophistication

3.10.2 Recommendation

Rather than building Web and Internet infrastructure at each local campus, GartnerGroup recommends that CCC establish statewide initiatives to establish an infrastructure and support model for Web hosting and distance learning. (Note: This will not limit individual campuses from deploying their own curriculum on the Web.)

Assuming 10 percent of all students each take one course on the Web, then we have approximately 75,000 students. Further, assume that labs are open 16 hours per work day, making an 80-hour open lab week. Assuming that each student takes one course and spends six

hours per week on the Internet, this amounts to an average 75,000*6/80=5,625 simultaneous sessions. As shown in Figure 4, this is classified as a large site. Supporting this traffic will require T3-level bandwidth. The cost for such a site is several million dollars. However, by leveraging the economies of scale, there should be significant savings over the development of 107 individual college sites or the 72 district office sites.

	Low-end	Midrange	High-end corporate	High-end standalone
Potential end-user population	10,000	100,000	1M	10M+
Active or regular end users	< 500	< 5000	< 100K	100K - 900K+
Visits per day	< 100	< 1000	< 20K	100K - 1M+
Page views per day	< 1000	< 10K	< 200K	500K - 10M+
Hits per day	< 10K	< 100K	< 2M	2M - 100M+
Bandwidth installed	56K	384K	Two T1s	Multiple T3s
Physical locations	1	1 to 2	1 to 3	2 to 6+
Hardware cost	< $20K	< $60K	< $200K	$100K - $1M+
Staff size in full-time equivalent	1 to 3	3 to 9	6 to 12	10 to 100+
Staff size as individuals	1 to 6	3 to 20	10 to 50	20 to 300+

K Thousand
M Million

"Top 200"

Source: GartnerConsulting

Figure 4. GartnerGroup Metric for Corporate and Standalone Sites

3.11 IT Support and Staffing Models

IS staffing is defined in the GartnerGroup model as being comprised of systems management staffing, support staffing and development staffing. IT support staffing is one of the biggest challenges for most campuses, which range from a 30-percent to 60-percent shortage on average. In order to determine the total additional budget for staffing to be funded, GartnerGroup recommends that a gap analysis be done for each campus. The assumptions are shown on the TCO model for campus sites, as shown in Table 1. The costs, however, have already been accounted for under student, faculty and administration staffing TCO models.

3.11.1 Systems Management

Systems management is the direct IS labor expenses and outsourcing fees for managing the network, desktop and mobile computers, servers, applications and storage infrastructure. The successful management of the infrastructure forms the basis for a solid business-computing platform and satisfied end users.

3.11.2 Direct Costs—Support

Support costs are the direct labor expenses and fees associated with supporting the network's end users. Labor and fees are divided into two categories: help-desk support (i.e., Tier 1 support only) and operations (i.e., the overhead tasks necessary to deliver IS services to the organization). Operations labor and fees include support contracts (i.e., Tier 1 only), IS and end-user training, procurement, vendor management and IS executive/middle management overhead labor. Help-desk support is comprised of help-desk staffing expenses and key help-desk metrics. Help-desk metrics include calls per month, abandon rates, on-hold time, call time and first-call resolution rates.

3.11.3 Direct Costs—Development

Development costs are the annual IS labor expenses and fees for the design, development, testing, documentation, configuration management and maintenance of all applications. Applications considered in the development section can be divided into two categories:

- Infrastructure applications—Those programs that provide the base functions for productivity and business, but do not directly provide business services. Infrastructure applications include systems-management programming, customization of collaboration and communications software, database software setup and programming of office-productivity suite software.
- Business applications—Those programs that generate, track or manage business revenue and are considered mission critical, including programs for financial and accounting, payroll, inventory management, order processing, human-resource management and other horizontal and vertical business applications.

3.12 Training

This section encompasses training for staff of all kinds and faculty.

3.12.1 Background

While the computer is evolving into a more user-friendly and intuitive tool, specialized training is required to make full and efficient use of this increasingly powerful device. This is as true, if not more, on California's community college campuses as in any other environment.

3.12.2 IT Staff Training

Much of the reduction in complexity for the user has resulted in increased complexity for the IT professional. The importance of employing a sufficiently large staff of IT support professionals has been addressed earlier in this report. As important as hiring technically qualified personnel for these positions is, providing opportunities for continued training to help these professionals keep their technical skills current is equally important.

Figure 5 offers examples of IT staff training costs based on GartnerGroup research. Most IT staff support training programs offered by vendors range from 1 day to 2 weeks in length, depending on the complexity of the subject and depth of training.

Classroom-based training costs, based on the number of enrollees and prevailing course enrollment costs	
	Price/ Enrollee
Operations and Support Training Requirements	$1,950
• **Windows NT Support Specialist Training (OS)**	1,950
• **NTS Server Administration Training (NOS)**	1,950
• **Relational Database Administration Training (Oracle)**	6,500
• **LAN Troubleshooting Skills Training**	1,950
• **Specialist Training (General)**	1,950
• **Ethernet Training**	1,950
• **Router and Hub Configuration and Maintenance Training**	1,950

Figure 5. Classroom-Based Training Costs

3.12.3 GartnerGroup Recommendations

As the CCC technical infrastructure continues to grow and evolve, IT support staff will continually require technical training.

3.12.4 GartnerGroup Recommendations

GartnerGroup recommends the following:

- As the CCC technical infrastructure continues to grow and evolve, IT support staff will require continuing technical training.
- The cost of this training must be planned for, annually, and incorporated into the classified personnel overhead calculations along with health and welfare, space, retirement and the like.
- Resulting increases in the classified staff overhead burden are an addition to the baseline budget of each campus.

3.12.5 Training Assumptions for Support Staff

- Assumption 1. One week training per support staff FTE per year.
- Assumption 2. An average cost of one week of training is $2,000.

- Assumption 3. Support staff per campus ($8,000) times 106 campuses equals $848,000 per year systemwide.

3.13 End-User Training

User training is fundamental to the effective use of technology on CCC campuses. Users can be classified into three major categories:

- Students
- Faculty and laboratory assistants
- Classified and management staff.

3.14 Student Computer-User Training

Students are, and will continue to be, trained formally and informally in classrooms, laboratories, libraries, study groups and, potentially, help desk personnel, assuming sufficient support staff availability. All CCC campuses offer basic computer skills classes. Here, students can learn the fundamental operation of the computer and how to use basic commercial-off-the-shelf (COTS) packages for composition, computing and presentation.

Students receive additional training from faculty and laboratory assistants in computer-assisted classrooms and computer laboratories related to (traditional) academic subjects. Students can gain additional training by enrolling in computer programming, computer graphics, Internet usage and other classes offered on campuses around the state. Last, but certainly not least, the students learn to use their computers effectively in informal communities of learning with their peers. No additional end-user training dollars for students are considered in the recommendations for the Technology II Plan.

3.15 Faculty (End-User) Training

Effective faculty end-user computer training is a pivotal requirement if the Technology II Plan is to succeed. Several of the faculty members who participated in the faculty focus group discussions pointed out that their students were far more "computer literate" than they were. This has resulted from increased exposure and usage of the computer in the K-12 years. This perception was echoed by many of the students, who felt the learning experience was diminished by the faculty's inexperience with the use of technology as an instructional tool. A significant body of research exists that supports these faculty and student observations.

First, the demand for IT-based teaching and learning programs will grow substantially, probably exponentially, over the next decade. In an economy that is increasingly knowledge-based, the new IT offers an economical means of providing the continuous education that the U.S. labor market requires. Distance learning is rapidly becoming a more readily accessible form of post-secondary education, and certification and degree programs. Second, IT will change teaching and learning profoundly, no matter what the response of traditional higher education institutions.

The research also points to some of the reasons for this classroom IT deficit. CCC faculty echoed the broader research findings. Helping faculty to appropriately integrate technology in academic instruction must be a key objective of the Technology II Plan. It is important, however, to point out that the use of technology in the classroom is not, in itself, the goal. The goal is to improve the educational experience through the use of technology. The goal is not to diminish the intrinsic value of the human exchange between student and teacher. Faculty members who participated in the focus groups are extremely conscious of their responsibility to teach students how to think critically, especially in the face of an ever-increasing deluge of raw data pouring from the Internet.

A number of the faculty members who participated in the focus groups and individual interviews already present their lecture material using presentation tools (e.g., Microsoft PowerPoint). Many had Web sites where they posted lecture materials, homework and other classroom-support materials.

Many others, however, have never had the opportunity to participate in training that would allow them to use these techniques. Many faculty members would like to redesign class syllabuses to incorporate multimedia and other advanced technologies or develop new technology-enabled syllabuses (additional course offerings) for traditional or distance education, but cannot because of the time demands of their current teaching loads.

The faculty advocated additional assistance in technology training and instructional design and/or additional release time to self-teach. Further, the faculty noted that there is little recognition of the level of effort required to produce high-quality, technology-enabled teaching materials or even to navigate the ever-growing alternatives in computer-based training (CBT) software for specific educational purposes. They believe that the current faculty evaluation process does not support their (quality teaching) investments in technology. Again, their local concerns are supported by the larger findings of EduCause and the Council for Higher Education.

According to Kenneth C. Green's Campus Computing Survey, 1998, although survey respondents identify instructional integration as a major IT challenge for their campuses, the survey data reveals that few institutions formally recognize and reward faculty for their investments in IT and instruction as part of the review and promotion process. Although most campuses encourage faculty efforts toward IT integration, institutions generally ignore IT as a factor in personnel reviews.[3]

3.16 Integration of IT as an Instructional Tool

How to encourage the effective integration of IT as an instructional tool continues to be a subject of research for both faculty and administration. Is it more appropriate for faculty to actually develop courses or to delegate the majority of the pedagogical aspects of this exercise to technologists?

[3] Kenneth C. Green, "Campus Computing 1998 Survey," February 1999.

Dr. Bruce Simmerok, the Director of the Office of Faculty Development at Azusa Pacific University recently wrote the following:

- "In developing our online courses we have taken both routes. We are finding that the faculty who have played a major role in the translation of their courses to the Web environment show more ownership of the course. They are better managers of the course environment when it goes online. In this case we find 'instruction in search of technology.' If the faculty are given appropriate choices, they can pick out the most appropriate technology to accomplish the objectives of the course."
- "When the project is given over to the 'expert,' you are more likely to find 'technology in search of instruction.' The technologists apply what technology they think would fit the situation. This may or may not be what the faculty had in mind. The result is more frequent and continual editing changes to come up with a usable course."
- "Although it may appear to take longer, the first option is the most efficient and has the most payoff in online instruction and improved teaching and technology in the traditional class."

GartnerGroup agrees with this assessment, both philosophically and practically. GartnerGroup does not believe that the educational objectives of CCC can be met by delegating responsibility for the integration of technology into the instructional program to technologists. Further, GartnerGroup does not believe that this integration can take place in a random fashion. Rather, it is important that each campus have an IT strategic plan that supports both the curricular and administrative strategies of the college. The IT strategic plan should be driven by the educational and community service goals of the college and should lay out an orderly series of related initiatives to achieve these goals over a time horizon. The importance of the existence and use of such a plan in making effective use of the campus' technology budget cannot be overestimated. Again, subsequent year funding of the Technology II Plan at each campus is recommended to be conditional upon conformance to the campus' IT strategic plan.

GartnerGroup believes that if the CCC faculty is going to succeed in integrating technology to improve the student experience through the development a plan alone, faculty will need training and IT support to implement the plan. They will require assistance in finding the right technology tools to achieve the desired outcomes and in learning how to use the tools that are selected. Further, learning how to use the tools is not limited just to an initial tutorial, but assumes ongoing assistance to ensure that the faculty member is able to focus on the course content. GartnerGroup research shows that the lack of readily available user help and support is a primary barrier to the successful adoption of new technology and new technology-enabled methods in every professional discipline.

But training and support is not enough in all cases to achieve the integration of technology into the curriculum or to achieve it at the pace that students demand. Another key is to find the appropriate incentives for individual faculty members to participate in these integration projects. Incentives will be required for a variety of reasons. Incentives may be offered in recognition of the difficulty, or complexity, of the actual porting of the course to a technology environment (i.e., keying of mathematical formulas into the computer requires significantly more time and

effort than simple text, even when using the same development tool). Incentives may be offered to encourage faculty to undertake research to compare several competing instructional software products (i.e., to establish an appropriate research environment in which to accurately determine which, if any, of the products achieve desired outcomes and why). Incentives may be offered in recognition of the effort involved in proving that the technology mediated course achieves the expected (i.e., predicted) results in student outcomes (i.e., the additional effort required to teach the same course in parallel sections using two different syllabuses and two different student/faculty interaction modes). Incentives may even be offered to encourage faculty to overcome the barriers to trying something new and something that their students know more about than they do (i.e., conducting student chat groups on the Internet in lieu of a laboratory or classroom lecture).

3.17 Key Elements of an Effective IT Training Strategy

Faculty focus-group participants pointed to three key elements required in an effective IT training strategy for their peers. These elements are consistent with the broader research findings:

- Fragmented communication patterns isolate individual faculty members and prevent them from interacting around issues of undergraduate education.
- Tight resources limit opportunities and strain faculty relationships.
- Prevailing methods of evaluation and reward undermine attempts to create an environment more conducive to faculty interaction.[4]

Other issues include the following:

- CCC faculty members who participated in the focus groups believe they need to have their existing workload reduced while they are designing/redesigning (technology enabled) course syllabuses. They believe that even the effort to integrate technology into existing syllabuses requires more time and thought than the normal activity of refreshing their course teaching materials with updated information or the lessons learned the last time the class was taught.
- CCC faculty members who participated in the focus groups believe that they should be held accountable for sharing the lessons of these development efforts among the wider community of CCC faculty. Satisfying this requirement means providing methods to facilitate communications, such as travel stipends, as a part of the Technology II Plan.
- CCC faculty members who participated in the focus groups believe that, if there is a requirement for use of technology to effectively teach in the 21st century, this should be an element of their formal performance reviews.

Resolution of these issues faculty issues lies outside the scope of this IT plan.

[4] William F. Massy, Andrea K. Wilger and Carol Colbeck, "Overcoming, 'Hollowed' Collegiality," Change 26, No. 4 (July/August 1994).

3.18 GARTNERGROUP RECOMMENDATIONS

GartnerGroup recommends that the Technology II Plan contain funding to assist faculty members in appropriately integrating IT into their campus curricula and sharing the benefits of this experience with other faculty members on other campuses through a collaborative association using the @O.N.E. program as its secretariat.[5]

Other recommendations include the following:

- One of the regional faculty training centers to be designated as the CCC (systemwide) IT Instructional Resource Center.
- Statewide and regional centers faculty training centers (including but not limited to @O.N.E., California Virtual Campus Centers, High Tech Center Training Unit for Assistive Technologies, Online Curriculum Resources, etc.) should be required to work collaboratively. The Technology II Plan should include funding for a designated center to collect and catalog all best practices and lessons learned, individually, to be shared systemwide. In addition, this center will coordinate with the California Virtual University to collect and disseminate training materials, etc., for faculty engaged in distance learning.
- Access to all shared faculty resources will be provided through a Web-based portal open to all instructional and related support staff. This portal will be administered by the designated training center.
- Continued campus-level funding for faculty technology-training activities should be conditional on their collaborative participation with the central resource center.
  - In addition, the Technology II Plan should include funding for faculty IT training and to assist the faculty in instructional design, including the design of instructional resources accessible to students with disabilities.
- Faculty members will participate in faculty train-the-trainer programs and conduct on-campus faculty training programs using materials and techniques learned from these programs.
  - Equally, campus faculty trainers will contribute best practices and lessons learned to be shared systemwide through the central portal.
- The CCC Chancellor's Office should continue to fund a central portal as a systemwide service provider.
  - The central portal would coordinate its activities, development of training materials, etc., with the California Virtual Campus training initiatives for faculty engaged in distance learning.
    - » Year-to-year continued funding for all training initiatives will be based, in part, on evidence of collaboration and the participating faculty trainer feedback and formal evaluation administered by the Chancellor's Office.

[5] Secretariat: The office or position of a governmental secretary.

- The Technology II Plan should include funding for budgeted FTEF positions to provide faculty IT training and instructional support. Their job duties would include, but not be limited to, the following:
  - » Assist faculty in identifying appropriate technologies to enrich course offerings and/or to encourage particular student outcomes, including the development of distance education resources accessible to students with disabilities.
  - » Assist faculty in identifying appropriate technologies to create and enrich new course offerings and/or to encourage particular student outcomes including the development of distance education resources accessible to students with disabilities.
  - » Assist faculty in incorporating appropriate technology into existing and new syllabuses.
  - » Assist faculty in learning new presentation techniques to effectively deliver technology-enabled instruction.
  - » Share best practices developed and lessons learned with other faculty and instructional designers through collaboration mechanisms.
  - » At the discretion of the college, an instructional designer/technologist may be a faculty member or classified staff member.
  - » At the discretion of the college, these funds may be used to add additional staff or to provide time (reassign, stipend, other funding, etc.) to existing faculty members to provide technology mentoring to their colleagues. Such mentoring might occur across or within an instructional department and might involve the general use of IT in instruction or the specific use of discipline (related) applications.
  - » It is assumed that the position will evolve from a training to an advanced educational IT researcher as the faculty, in general, becomes more adept at the use of technology in the development and delivery of coursework and classroom materials.

3.18.1 An Illustrative Example

- Assumption 1: 24,776 permanent FTEF in 1998 (last full year reported).
  - FTE trainer/designer per 200 permanent FTEF in Year 1
  - FTE trainer/designer per 150 permanent FTEF in Year 2
  - One FTE trainer/designer per 100 permanent FTEF in Year 3
- Assumption 2: Mean full-time faculty compensation (based on 1998) is $59,295.
  - The cost in Year 1 is one FTE*124 FTEF faculty*$59,295 = $7,352,580.
  - The cost in Year 2 is one FTE*165 FTEF faculty*$59,295 = $2,431,095 additional over Year 1.

- The cost in Year 3 is one FTE*248 FTEF faculty*$59,295 = $4,921,485 additional over Year 2.
- Three-year implementation cost is $14,705,160.

- Assumption 3: Statewide faculty technology development center administrative costs will be continued at Technology Plan I rates, adjusted for CCC FTE growth and COLA = $500,000 current year funding.

3.18.2 Incentive for Faculty to Incorporate IT into Curriculum

- The plan should include funding to provide appropriate incentives to faculty members who appropriately integrate IT into their campus curricula and share the benefits of their experiences with other faculty members on other campuses. Using the secretariat concept can facilitate this sharing of experience and actual course syllabuses and other instructional materials.
- Incentives might take one or more of the suggested methods described below:
  - Among the most-common types of incentives are a temporary reassignment of faculty from the classroom to the computer laboratory as an incentive for faculty to explore the integration of technology and instruction.
  - Other campuses may offer an additional stipend to participating faculty to compensate for the extra effort required.
  - It is assumed that, over time, more courses will be developed using and relying on technology as a matter of course. When this trend becomes predominant, the nature of the faculty incentives could change from facilitation to reward.
- Continued funding of the incentives should be dependent on demonstrating that they are meeting their objectives as evidenced by the following:
  - Inclusion of a curricular strategy in the overall campus IT strategic plan
  - Demonstration that instructional incentives are offered for courses that are consistent with the strategy and, at least initially, test the appropriateness of that strategy.
    - » How many classes are converted for distance education?
    - » How many courses are successfully using technology mediation in the traditional classroom?
- Demonstration of positive student reaction
  - Number of students enrolled compared to number enrolled in control classes
  - Improved student outcomes in technology-mediated sections
  - Compared to other Web-based classes in related disciplines
  - Effectiveness of incentives offered in improving student outcomes
- Adoption of the course and syllabuses by other faculty on the original campus and on other campuses in the CCC system

- Determination of appropriate measurements and tools for measurement of success during the Technology II Plan to be incorporated into a future Technology III Plan
- The allowable categories of training should closely align with the needs of the faculty in integrating instruction and technology.
  - Workshops, seminars, lectures, conferences or retreats, the costs of which are paid from the college or district funds
  - Instructional resource centers or experts that work with faculty and/or staff to help improve teaching skills
  - Computer centers that provide help, service and/or staff to faculty on the use of computers for instruction and/or research
  - Media centers that work with faculty and/or staff on the use of visual aids in teaching or in professional presentations
  - Individual flexible calendar activities, as approved by the college or district.

3.19 Illustrative Example

- $2 million in the first year
- $5 million in the second year
- $5 million in the third year.

This funding recommendation is based on the demonstration that the use of the funds for these activities improves the integration of instruction and technology during the first year (and second year), as measured above.

Technology II Plan Year	Faculty Training	Staff Training	Total Budget
Year 1	$2,000,000	$840,000	$2,840,000
Year 2	$5,000,000	$840,000	$5,840,000
Year 3	$5,000,000	$840,000	$5,840,000

Table 12. An Illustrative Example of Total Direct Training Funds

4. FUNDING

4.1 Funding Background

The current technology funding approach for CCC cannot be used to successfully deploy and sustain any technology strategy.

- Faced with a year-to-year budgeting process and no assured, predictable level of funding for technology initiatives, campus CEOs are reluctant to make multiyear commitments to permanent IT staff or to long-term vendor relationships.
  - TTIP funds are appropriated by the Legislature as a part of the annual budget change proposal process. Funds are appropriated as a lump sum and then apportioned to the campuses.
  - Some TTIP funds are apportioned to the campuses by the Chancellor's Office, based on grant requests submitted by the campuses. Currently, the funds for a particular research issue (e.g., online transcripts) are divided between several colleges who pursue parallel or different solution options. The size of the grants can impede the due diligence given to each potential solution option. This results in redundant expenditures further limiting the total CCC system's technology development. On the other hand, the same dollars distributed more narrowly would allow a more rigorous analysis of any particular solution, leading to a faster, more broadly applicable solution.
  - There are no technology standards in place (i.e., desktops, printers, LAN and campus WAN networking protocols). This prevents the Chancellor's Office from negotiating the most-advantageous statewide procurement contracts, which would lead to economies of scale that would result in more technology on every campus for the same cost.
  - Currently, technology purchases are made by the individual campuses. This can be done directly with the vendor or through the auspices of a quasi-public, quasi-private Community College Foundation. Participation in these blanket purchase agreements is wholly voluntary and does not require the adherence to established technology standards.

4.2 GartnerGroup Recommends a New Funding Approach to Technology Funding and Technology II Plan

GartnerGroup recommends that a new approach be taken to funding community college technology initiatives, beginning with Technology II Plan. First, the Legislature must recognize that technology investment is continuous and evolutionary, not episodic and revolutionary. That is, funding for technology development on the community college campuses should continue to be a part of the permanent baseline budget of the system and its participating campuses. This ensures that, except in cases of statewide fiscal emergency, there is a predictable level of funding encouraging the campuses to make the required investments in classified staff, technology tools and vendor support needed to maintain the quality and competitiveness of the campuses.

The CCC should clearly identify the educational and community service objectives of technology spending as a justification for requesting a technology spending appropriation. The objectives should be measurable (i.e., predictable outcomes) and a plan to achieve them should be incorporated in the funding request.

Objectives should result in outcomes, which could not have been achieved without the expenditures. By establishing objectives (i.e., outcomes) and accepted accountability for the results, GartnerGroup believes that the CCC leadership can build a stronger business case to present to the Legislature for initial funding of Technology II Plan. Further, GartnerGroup believes that, when the Legislature and local trustees can identify positive results from these expenditures, they will continue and increase funding to support technology-enabled initiatives. Last, publication of objectives and results will build public and private support for continued and expanded investment in educational technology for the CCC.

The Legislature should make continuing funding of Technology II Plan contingent on (reporting of) measurements that demonstrate that these objectives are being met. The Legislature should recognize that, statistically, the predicted results couldn't be met in a single fiscal year but that trends will develop in the second and third year of funding, if they are going to occur at all.

GartnerGroup understands that the Chancellor's Office is considering the introduction of a separate budget appropriation bill to fund Technology II Plan. If the Legislature, CCC Governing Board and local trustees agree, Technology II Plan proposes that funding be apportioned to all campuses, based on FTESs and limited to supporting these identified priorities. If approved, the funds would be distributed through the Chancellor's Office based on the following:

- FTES apportionment would be adjusted so that the smallest colleges and the largest colleges would not be underfunded or overfunded compared to median spending.
- Demonstration that the campus has a local IT plan that supports the statewide strategic educational objectives: access, quality, enrichment and administrative efficiency.
- Demonstration (in plan years 2 and 3) that the campus has used the funds to support the stated priorities and can provide measurement data demonstrating progress in meeting these objectives. Since it is likely that the campuses would not receive first-year funds until some time in the fall of 2000, this demonstration would, most likely, consist of detailed plans and supporting execution documents.
- Campuses with additional available funding can exceed the minimum standards without penalty, but if statewide funds allocated to the campus are used to meet the infrastructure minimum, the funds cannot be expended on any other Technology II Plan initiatives until the infrastructure baseline is achieved.

4.2.1 Funding Paradigm Shift

GartnerGroup recommends that the Chancellor's Office be required to develop a baseline of industry technology standards, including standards to support student access. Student access standards would include supporting special access needs under the Americans with Disabilities Act. Other considerations include the following:

- This baseline will be ratified by the TTAC.
- The baseline will become the basis for selecting technology vendor partners and negotiating statewide purchase pricing for baseline components.
- Contracts will be pursued and awarded consistent with California Codes and Regulations guidelines and processes.
- Colleges would be able to buy individually from these vendors at these contracted prices.
  - In addition to best pricing, this would eliminate administrative fees paid to the CCC foundation, increasing campus purchasing power.

GartnerGroup suggests that Technology II Plan be broken down into three major categories:

- Infrastructure
  - Data
  - Video
  - Satellite
  - Library automation
- Applications (R&D)
  - Telecommunications model applications pilot projects
  - Telecommunications special projects
- Training
  - Human resources technology training fund
  - Coordinating and disseminating training resources.

GartnerGroup recommends that, once the baseline infrastructure minimums are achieved, the campuses be responsible for determining the internal distribution of these funds to support the Technology II Plan technology priorities.

4.3 GartnerGroup Recommends a New Approach to Measuring the Success of Technology II Plan

GartnerGroup believes that the objectives of Technology II Plan are clear. They lay out a rational and achievable approach to the overall use of technology in support the CCC Chancellor's educational objectives:

- Quality education for every student
- Improved educational outcomes for every student
- Enrichment of the educational experience for every student.

The Technology II Plan objectives support these larger goals by focusing immediate attention on expanding student access. The Technology II Plan objectives can be measured through incremental improvements by doing the following:

- Assume the development and/or maintenance of a district/campus IT strategic plan at all districts/campuses.
- Improve student access to computing through the development and/or expansion of districtwide/campuswide IT infrastructure.
- Increase online student services, which results in higher student satisfaction and improved student service.
  - Demonstrated by increased use of Web-based college applications, financial aid applications, counseling appointments scheduled, etc. (Specific student service focus will be established at the district/campus level.)
- Increase use of technology in the classroom and in faculty/student and student/student collaboration.
  - Number of on-campus courses using multimedia instructional materials
  - Number of distance learning courses offered
  - Number of distance learning sections of standard courses offered
  - Number of classes in which collaboration is encouraged through the use of e-mail
  - Number of faculty members with e-mail accounts
  - Number of students with e-mail accounts
  - Number of faculty members who have Web pages
  - Number of faculty members who post their lectures, etc., to the Web site
  - Faculty recognition (awards) for creative use of technology to enhance existing/create new curriculum.
- Increase faculty and student participation and utilization of distance learning as a demonstration of the successful integration of C4Net and campus technology infrastructure and cross-campus collaboration for the benefit of students.

4.3.1 Alternative Financing and Investment Strategies

GartnerGroup research indicates that approaches to financing technology acquisition for higher educational institutions are as diverse and varied as the states. They are also in considerable flux at this time. For the most part, technology support from state governments is similar to the California model in many respects. State government funding reflects the bolt-on strategy of technology application found at the campus level. In good budget years, legislators tag on technology funds to base budget appropriations aimed at a potpourri of statewide and campus infrastructure initiatives. Seldom are these funds part of a comprehensive plan, nor is there much agreement as to the appropriate sources of revenue for different types of expenditures.

Technology, like other hot-button issues, is treated as a vehicle for garnering greater financial support to the system. Everybody is happy in the short term, until the inevitable disappointment sets in when the potential for technology to either improve quality or lower costs goes unrealized because of the lack of an underlying technology vision. This vision can only occur in an atmosphere of consistency and predictability.

This ad-hoc approach to technology funding, fortunately, is giving way to more thoughtful and strategic thinking in some states. Given the pervasive influence of IT on higher education described by Twigg and Heterick in Public Policy Implications of a Global Learning Structure, it is not surprising that virtually the entire array of financing policies that govern higher education is under scrutiny.

4.3.2 Financing Plans Should Outline Mutual State and Institutional Obligations for Funding with the State Focus on Achieving Important Systemwide Goals

The first step toward a comprehensive plan for technology use, anywhere, is agreement over mutual obligations for funding. There are several sources of funds for technology purchases and applications: base budgets, revenues from tuition and product sales, productivity savings, student technology fees and earmarked funds from the Legislature. But what revenue streams should support what purchases?

Participants in the study generally agreed that if the state is going to invest earmarked funds in technology development, these funds should accomplish objectives that might not otherwise be undertaken by individual campuses. Too many states are financing the purchase of desktop equipment and other campus infrastructure initiatives with special appropriations, while strategic investments in important programmatic and learning objectives are neglected.

Participants in a National Science Foundation-sponsored symposium agreed that investments in statewide IT infrastructure were needed, as well as multicampus approaches to support distant learners (e.g., library and virtual catalog initiatives). Program initiatives that are tied to state economic development priorities or unsolved learning problems (e.g., remedial mathematics) should also be considered. This position is consistent with higher educational policy in California.

4.3.3 State Investments in Broadband Digital Networks Should be Used to Leverage Price and Service Advantages from Telecommunications Providers

Robert Heterick and Mark Luker of the National Science Foundation have encouraged states to increase their investments in statewide digital networks. Collective action to develop digital statewide networks has several advantages.

State entities charged with representing a broad range of governmental agencies, K-12 and higher education can effectively garner significant price and service advantages from telecommunications carriers. This is especially helpful to small and rural agencies and institutions.

But beware of promises to state policymakers that all needed services can be adequately handled by the telecommunications companies, several discussants warned. Many statewide network administrators are finding, for example, that the telecommunications companies are struggling with meeting increased customer demands and their own transitions to digital technologies, leaving them with unreliable delivery networks. Many statewide network entities are concluding that they must provide additional technical and help-desk support to institutions.

Pricing policies for electronic delivery of courses, modules, etc., need a thorough examination. A market-driven system of higher education for electronic delivery suggests that the price charged to students be set according to market factors. With the choices for Internet delivery growing daily, students can choose between price and quality (or reputation) or try and maximize each. They may ask, for example, "What is the highest level of quality that I can get for the lowest price?" or "What additional price am I willing to pay for the convenience of not having to go to campus?" Current practice appears to be evolving toward an electronic rate, which is somewhat higher than in-state public rates, but lower than out-of-state tuition. As more and more providers enter the market and quality improves, one would expect the e-rate to fall significantly.

Unfortunately, this pure market approach may have serious shortcomings that will necessitate specific state intervention. As Dennis Jones put it, "Individual consumer responses don't necessarily add up to state need." Curriculum development may be skewed by the willingness of third-party payers to cover the costs (more electronic curricula for engineers, doctors and high technology employees, little or none for government employees, childcare workers, etc.). Such programs and their students will need state subsidy. A market-driven system of higher education for electronic delivery suggests that the price charged to students be set according to market factors.

4.3.4 State Funding Should Encourage Collaboration Across Departments, Institutions and States

In a background paper written in support of Heterick and Swiggs, Dewayne Matthews urged states to develop mechanisms for developing joint courses and programs. While the traditions of campus autonomy have often constrained joint-program development, the competitive factors brought about by global learning networks may be enough to push institutions to collaborate out of economic necessity.

It is interesting to note that recent findings of the Council on Higher Education find community college enrollment is the only higher education enrollment that is on the decline. Increasingly, the community college finds itself competing with private, vocationally oriented schools that offer faster diplomas/certifications, more aggressive job-search support, and better technology tools with better access to the tools. These improvements, of course, are purchased with higher tuition. Without a new approach to funding programs that students believe they need and will pay for, the community colleges risk becoming the higher education choice of only the economic "have nots." To avoid this possibility, Mathews argues, "It would be in the state's interest for institutions to hook up with others to develop new programs and distribute them across a wider geographic area." States can reinforce this objective through changes in their program approval criteria and by providing funds directly to new collaborative structures.

4.3.5 States and Campuses Should Rethink Program Cost Accounting and Related Allocation Policies

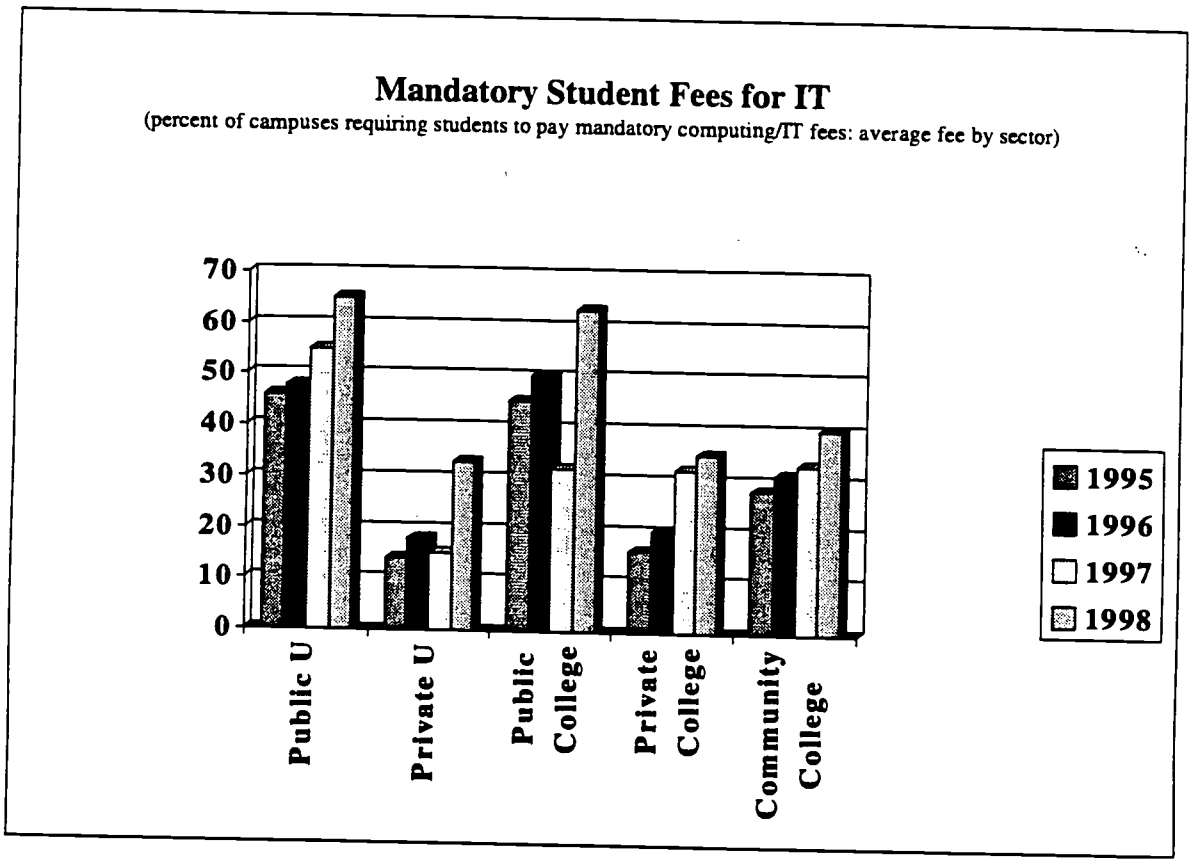
Concomitant with the organizational changes brought about by unbundling educational services, the segregating effects of technology described by Twigg and Heterick may also change the way in which states fund higher-education programs. Frank Jewett of the California State University System, in an NLII-related project (funded by the federal government), has been studying the costs and benefits of various approaches to technology-mediated instruction. One of the most-valuable contributions of this study will be to segregate the various activities that are bundled under what we call instruction (e.g., course development, marketing, delivery, transmission, student support, amortized capital costs, and assessment costs.) The CSU study will allow a closer examination of the cost dynamics related to various delivery modes and permit systems and campuses to change their allocation and revenue flows to recognize the contributions of multiple contributors to the instructional delivery system.[6]

4.3.6 On Student Technology Fees

According to Kenneth C. Green's Campus Computing 1998, rising IT fees reflect the continuing financial challenges colleges that confront in attempting to provide more and better IT resources and services for students and faculty. Yet campus officials must avoid the temptation to use student fees to supplant, rather than supplement, the institutional investment in IT. This is a particularly pressing issue for public institutions, as state officials may be tempted to have

[6] Robert C. Heterick, Jr., James R. Mingle, and Carol A. Twigg "The Public Policy Implications of a Global Learning Infrastructure" (November 1997)

students cover a larger share of rising institutional IT costs. Indeed, from almost any perspective, it is clear that computer networks, user support services, software and content licenses, computer labs and instructional classrooms are key components of the campus technology infrastructure. These core IT resources need more than just student fees to be viable and reliable.[7]



Source: GartnerConsulting

Figure 6. Required IT Student Fees

[7] Kenneth C. Green, "Campus Computing 1998" (February 1999).

Appendix B

Total Cost of Ownership

The following are the key assumptions of the Total Cost of Ownership (TCO) model:

- Funding model to assure appropriate staffing.
- The TCO is composed of five areas and 19 items.
- The total TCO is $3,506.
- The size of the model campus is 12,000 FTES.
- There is a 1:3 ratio of support staff costs to hardware/ software costs.
- There is a three-year replacement rate for computers and related equipment.
- Ten percent of all computers to be configured for assistive technology.
- Fourteen-hour per day student access.
- Two-hour response time for classroom support.
- Twenty-four-hour response time for non critical problems.

The table is divided into five parts. The first part addresses the three areas of hardware, software, and training. There are twelve items in part one. This part does not have any direct staff components identified within. The two items that address training may have personnel costs associated with it but is not required. Parts two through five are all related to support cost and are identified as personnel. The areas address the support components required for the management of the networks, application development, end user support, and communications. The table in parts two through five also includes the calculation for the recommended FTEs for the identified area.

Total Cost of Ownership Model

(College model is based on one average college with 12,000 FTES enrollment)

Direct Costs of Hardware, Software, and Training

Sub Category	Cost/yr./PC	Assumptions	Accumulated Costs	Support Staff
PC Hardware and Operating Systems Cost	$550/yr.	(Acquisition depreciated over 3 years)	$605,000	N/A
Assistive Technology Hardware and Software (10% of PCs)	$667	(Acquisition depreciated over 3 years)	$160,000	N/A
O/S and Office Software Licenses	$100/yr.		$110,000	N/A
Peripherals	$100/yr.		$110,000	N/A
Network Operating System Hardware	$45/yr.	1.5 servers	$49,500	N/A
NOS Licenses	$20/yr.		$22,000	N/A
Switches, Hubs, and Bridges (Hardware and Software)	$42/yr.	$125/port	$46,200	N/A
Wiring	$60/yr.		$66,000	N/A
NSM Hardware and Software	$160/yr.		$176,000	N/A
Training	$250/yr.		$275,000	N/A
Servers (HDW and SFTW) for Web Services	$50/yr.		$55,000	N/A
Technical Staff Training	$75/yr.		$82,500	N/A
Sub-Total Cost	**$2,119**		**$1,757,200**	

Note: Chart does not include printers for assistive technology. The printers are estimated at $4,000 per printer. One printer per each lab that provided assistive technology would be necessary.

Direct Costs of Systems Management

Sub Category	Cost/yr./PC	Assumptions	Accumulated Costs	Support Staff
Network and Systems Admin. (Novel, etc. include wiring staff)	$313/yr.	1 staff/300 PCs; (3.66) loaded cost= $75,000/yr. + 25%	$343,750	3.6 FTEs
Technical Management	$238/yr.	1 / 500 PCs @ $95K + 25%	$261,250	2.2 FTEs
Web Administration	$114/yr.	1 staff per 12,000 FTES; loaded cost= $100,000/yr. + 25%	$125,000	1.0 FTE
Administrative Systems Support (web, user dev. applications)	$97/yr.	1 @ $85K + 25%	$106,250	1.0 FTE
Sub-Total Cost	**$762**		**$836,250**	**7.8 FTEs**

Direct Costs of Support

Sub Category	Cost/yr./PC	Assumptions	Accumulated Costs	Support Staff
Level 1 Support	$417/yr.	1 staff/150 PCs; $50,000/yr. + 25%= $62,500/staff	$458,333	7.33 FTEs
Sub-Total Cost	**$417**		**$458,333**	**7.33 FTEs**

Direct Costs of Development Staff

Sub Category	Cost/yr./PC	Assumptions	Accumulated Costs	Support Staff
Application Development	$148/yr.	2 staff/12,000 FTES campus loaded cost= $65,000/yr./staff + 25%= $81,250	**$162,500**	2.0 FTEs
Sub-Total Cost	**$148**		**$162,500**	**2.0 FTEs**

Direct Costs of Communications Support

Sub Category	Cost/yr./PC	Assumptions	Accumulated Costs	Support Staff
Network	$60/yr.	24,000/yr.: 1-6000 FTES 48,000/yr.: 6,000-12,000 FTES 72,000/yr.: 12,000-18,000 FTES 96,000/yr.: 18,000+FTES	$66,000	1.0 FTE
Sub-Total Cost	**$60/yr.**		**$66,000**	**1.0 FTE**
Total Cost (TCO)	**$3,506**	**Accumulative Cost**	**$3,280,283**	**18.13 FTEs**

Appendix C

Descriptions of Student, Faculty, and Managerial and Classified Staff Baseline Models

Descriptions of Student, Faculty, and Managerial and Classified Staff Baseline Models

Table 1
Student PC Baseline Standard

	Category	Minimum Baseline Standard
A1	PCs for students	Year 2000-2005: 1 PC for every 20 FTES Ten percent of all campus computer systems will be configured with industry-standard assistive computer technology to provide access to students with disabilities.
A2	Printers	Sufficient printing will be available.
A3	LAN Access	Each PC will be LAN connected.
A4	Office Software	The majority of PCs will be equipped with office software. It will be up to the campus to decide whether to use a uniform configuration or a hosted applications model.
A5	Information Resources and Software	Each PC can access library databases, instructional servers, Web sites, and instructional software. Campuses will make every effort to assure that these resources are operational with industry-standard assistive computer technology.
A6	E-mail	Each PC will have Web-based access to the campus e-mail system. Students are required to obtain an ISP for access.
A7	Internet/intranet access	Each PC is equipped with a browser for Internet access.
A8	Virus detection software	Each PC is equipped with anti-virus software.
A9	Access to student services system through Internet/intranet only	Each PC will provide students with Web access to student services.
A10	Refresh rate and currency of computers	PCs and assistive-computer technologies will be replaced on a three-year basis, consistent with industry best practices. The rationale is to reduce TCO by introducing more manageable equipment and refreshing with new software
A11	PC support infrastructure	CCC campuses will use best-practice approaches to manage their PC population (e.g., ability for remote monitoring and management, electronic inventory of hardware and software).

Table 2
Faculty PC Baseline Standard

(Faculty Access Baseline Model)

	Category	Minimum Baseline Standard
B1	PCs for Full-time Faculty	One PC for every full-time faculty member.
B2	PC's for Part–time Faculty	A goal of 25 percent of full-time equivalent faculty (FTEF) over the three years with a minimum of one-third in the first year.
B3	Printers	One advanced laser printer to be shared across 50 faculty staff.
B4	LAN Access	All PCs will have network access.
B5	Office Software	Each PC has standard office software, including word processing, spreadsheet, and presentation-design software.
B6	E-mail	Each PC have Web-based access to the campus e-mail system.
B7	E-mail for adjunct instructors	Each adjunct instructor will have an e-mail account.
B8	Internet/intranet access	Each PC is equipped with a browser.
B9	Virus-detection software	Each PC is equipped with anti-virus software.
B10	Scanners	There will be one industrial scanner for every 100 faculty member.
B11	Access to administrative systems	Each PC will have access to administrative systems when appropriate (by the end of 2003).
B13	Information Resources and Software	Each PC should be able to support faculty research of library databases, educational software, and course management software.

Table 3
Managerial and Classified Staff PC Baseline Standard

(Administrative and Classified Staff Infrastructure Baseline)

	Category	Minimum Baseline Standard
C1	PCs for full-time administrative and classified staff	One PC for 80 percent of full-time managerial and classified staff, as appropriate.
C2	Printers	One advanced laser printer to be shared between 50 staff.
C3	LAN Access	Network access for each PC.
C4	Office Software	Each PC has standard office software, including word processing, spreadsheet, and presentation-design software.
C5	E-mail	All staff members will have Web-based access to the campus e-mail system.
C6	Internet/intranet access	Each PC is equipped with a browser.
C7	Virus detection software	Each PC is equipped with anti-virus software.
C8	Access to administrative systems	Each PC will have access to the administrative system, when appropriate.

Appendix D

Tech II Cost Breakout

Tech II Cost Breakout

(Costs in fiscal year 2000-2001, have been included in the Governor's proposed budget, Assembly Budget Committee action, and Senate Budget Committee action)

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Goal: Student Access								
A. Establish a baseline of access for students and faculty and staff that serve them that includes a technology "refresh" program for computers and related equipment at all colleges.								
Technology for Access (Faculty)	%	GartnerGroup Report TCO Model	Allocation (FTEF)					
Hardware/Software	57%				$1,101,129	$1,696,319	$2,084,572	$2,205,233
Systems Support	16%				$309,089	$476,160	$585,143	$619,013
End User Support	12%				$231,617	$357,120	$438,857	$464,260
Development Support	3%				$57,954	$89,280	$109,714	$116,065
Communications Support	2%				$38,636	$59,520	$73,143	$77,377
Training	10%				$193,181	$297,600	$365,714	$386,883
Project Total	**100%**			**$0**	**$1,931,806**	**$2,975,998**	**$3,657,143**	**$3,868,830**
Incremental Cost				**$0**	**$1,931,806**	**$1,044,192**	**$681,145**	**$211,687**
Technology for Access (Students), including Disability Access	%	GartnerGroup Report TCO Model	Allocation (FTES)					
Hardware/Software	57%			$2,258,649	$29,614,630	$44,085,905	$46,291,501	$48,606,071
Systems Support	16%			$634,007	$8,312,879	$12,374,991	$12,994,106	$13,643,809
End User Support	12%			$475,505	$6,234,659	$9,281,243	$9,745,579	$10,232,857
Development Support	3%			$118,876	$1,558,665	$2,320,311	$2,436,395	$2,558,214
Communications Support	2%			$79,251	$1,039,110	$1,546,874	$1,624,263	$1,705,476
Training	10%			$396,254	$5,195,549	$7,734,369	$8,121,316	$8,527,381
Project Total				**$3,962,542**	**$51,955,491**	**$77,343,693**	**$81,213,160**	**$85,273,809**
Incremental Cost				**$3,962,542**	**$47,992,949**	**$25,388,202**	**$3,869,467**	**$4,060,649**
Technology for Access (Staff)	%	GartnerGroup Report TCO Model	Allocation/ Full Time Staff					
Hardware/Software	57%				$2,937,685	$4,572,665	$4,801,264	$5,060,479
Systems Support	16%				$824,613	$1,283,555	$1,347,723	$1,420,485
End User Support	12%				$618,460	$962,666	$1,010,792	$1,065,364
Development Support	3%				$154,615	$240,667	$252,698	$266,341
Communications Support	2%				$103,077	$160,444	$168,465	$177,561
Training	10%				$515,383	$802,222	$842,327	$887,803
Project Total				**$0**	**$5,153,833**	**$8,022,219**	**$8,423,270**	**$8,878,034**
Incremental Cost				**$0**	**$5,153,833**	**$2,868,386**	**$401,051**	**$454,763**
Goal A. Subtotal				**$3,962,542**	**$59,041,130**	**$88,341,910**	**$93,293,573**	**$98,020,673**
Goal A. Incremental Cost				**$3,962,542**	**$55,078,588**	**$29,300,780**	**$4,951,663**	**$4,727,100**

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
B. Support the development of student services technology applications that have systemwide impact.								
Technology Model Applications Pilot Project Grants New research and development feasibility study, and demonstration grants in telecommunications and technology to be determined by Telecommunications and Technology Advisory Committee		**Telecommunications and Technology Infrastructure Program Certification and Technology Model Applications Pilot Project Bridge Document**	**For Local Grants**					
Project Total				**$0**	**$0**	**$700,000**	**$700,000**	**$700,000**
Incremental Cost				**$0**	**$0**	**$700,000**	**$0**	**$0**
Goal B. Subtotal				**$0**	**$0**	**$700,000**	**$700,000**	**$700,000**
Goal B. Incremental Cost				**$0**	**$0**	**$700,000**	**$0**	**$0**
C. Provide a baseline suite of student support systems and services that could be available at each college (i.e., common application, electronic transcripts, digital signature, data warehousing, on-line registration, and Web hosting).								
Common Application **Electronic Record Exchange**		**Prior Feasibility Study RFA 98-0663**	**Systemwide Project**					
Local Operations								
Hardware					$180,000	$180,000	$180,000	$180,000
Staff					$75,000	$45,000	$45,000	$45,000
Software					$360,000	$0	$0	$0
State Operations								
Central Services					$875,000	$750,000	$750,000	$750,000
Promotion/Advertising					$200,000	$150,000	$0	$0
Project Total				**$0**	**$1,690,000**	**$1,125,000**	**$975,000**	**$975,000**
Incremental Cost				**$0**	**$1,690,000**	**($565,000)**	**($150,000)**	**$0**
Electronic Transcript		**Prior Feasibility Study RFA 98-0663**	**Systemwide Project**					
Local Operations								
Hardware					$180,000	$180,000	$180,000	$180,000
Staff					$75,000	$45,000	$45,000	$45,000
Software Purchase					$216,000	$0	$0	$0
Project Management					$176,720	$72,955	$46,891	$46,891
State Operations								
Software Development					$800,000	$600,000	$600,000	$600,000
Applications Cost					$100,000	$75,000	$75,000	$75,000
Project Total				**$0**	**$1,547,720**	**$972,955**	**$946,891**	**$946,891**
Incremental Cost				**$0**	**$1,547,720**	**($574,765)**	**($26,064)**	**$0**

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Digital Signature		Prior Feasibility Study RFA 98-0664	Systemwide Project					
Software License/Maintenance				$0	$150,500	$376,250	$752,500	$1,373,750
Hardware Acquisition				$0	$220,000	$250,000	$500,000	$80,000
Hardware Maintenance/Support				$0	$37,500	$75,000	$150,000	$162,000
Personnel Cost (Support & Training)				$0	$180,000	$270,000	$270,000	$270,000
Project Total				$0	$588,000	$971,250	$1,672,500	$1,885,750
Incremental Cost				$0	$588,000	$383,250	$701,250	$213,250
Web Hosting and Data Warehousing (Systemwide Access to CCCCO MIS Data)	%	Gartner/Fund for Student Success Grant (Technology Model Applications Pilot Project Bridge Document)	Systemwide Project					
Hardware	5%			$10,000	$100,000	$25,000	$25,000	$25,000
Software (System & end-user)	25%			$50,000	$500,000	$125,000	$125,000	$25,000
Networking/Internet Access	10%			$20,000	$200,000	$50,000	$50,000	$50,000
Personnel	25%			$50,000	$500,000	$125,000	$125,000	$125,000
Consulting	20%			$40,000	$400,000	$100,000	$100,000	$100,000
Advisory Committee	2%			$4,000	$40,000	$10,000	$10,000	$10,000
Staff Training	5%			$10,000	$100,000	$25,000	$25,000	$25,000
End-user Training	8%			$16,000	$160,000	$40,000	$40,000	$25,000
Project Total				$200,000	$2,000,000	$500,000	$500,000	$385,000
Incremental Cost				$200,000	$1,800,000	($1,500,000)	$0	($115,000)
On-line Registration		Prior Feasibility Study RFA 98-0663	Systemwide Project					
Hardware					$180,000	$180,000	$180,000	$180,000
Staff					$75,000	$45,000	$45,000	$45,000
Software Purchase					$216,000			
Software Development					$800,000	$600,000	$600,000	$80,000
Applications Cost					$100,000	$75,000	$75,000	$75,000
Project Total				$0	$1,371,000	$900,000	$825,000	$825,000
Incremental Cost				$0	$1,371,000	($471,000)	($75,000)	$0
Goal C. Total				$200,000	$7,196,720	$4,469,205	$4,919,391	$5,017,641
Goal C. Incremental Cost				$200,000	$6,996,720	($2,727,515)	$450,186	$98,250
Student Access Goal total				$4,162,542	$66,237,850	$93,511,115	$98,912,964	$103,738,314
Student Access Incremental $				$4,162,542	$62,075,308	$27,273,265	$5,401,849	$4,825,350

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Goal: Student Success								
A. Provide ongoing training for faculty in the use of information technology tools.								
Faculty Training Programs/Initiatives		**California Virtual University**	**Systemwide Project**					
Staff Development Center				$480,000	$480,000	$480,000	$480,000	$480,000
Region 1				$575,000	$575,000	$575,000	$575,000	$575,000
Region 2				$575,000	$575,000	$575,000	$575,000	$575,000
Region 3				$575,000	$575,000	$575,000	$575,000	$575,000
Region 4				$675,000	$675,000	$675,000	$675,000	$675,000
Web/multimedia hosting				$0	$500,000	$500,000	$500,000	$500,000
CCCCO Coordination				$20,000	$20,000	$20,000	$20,000	$20,000
Project Total				$2,900,000	$3,400,000	$3,400,000	$3,400,000	$3,400,000
Incremental Cost				$2,900,000	$500,000	$0	$0	$0
Technology Training (Faculty) A technology training fund allocated to colleges to help facilitate the training of faculty in the use of telecommunications and technology		**Telecommunications and Technology Infrastructure Program Certification Document**	**Allocation (FTEF)**					
Project Total				$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000
Incremental Cost				$7,000,000	$0	$0	$0	$0
Incentives to faculty to integrate IT into curriculum - Provides appropriate incentives to faculty to integrate IT into their campus curriculum and share their experience with other faculty on other campuses.		**GartnerGroup Report**	**Allocation (FTEF)**					
Project Total				$0	$2,000,000	$5,000,000	$5,000,000	$5,000,000
Incremental Cost				$0	$2,000,000	$3,000,000	$0	$0
Centralized Training Center Assist faculty/staff to enhance student learning & success through expanded uses of IT, by providing training, resources, and support.		**Telecommunications Systemwide Project (TSP)**	**Systemwide Project**					
Project Total				$500,000	$500,000	$500,000	$500,000	$500,000
Incremental Cost				$500,000	$0	$0	$0	$0
Goal A. Subtotal				$10,400,000	$12,900,000	$15,900,000	$15,900,000	$15,900,000
Goal A. Incremental Cost				$10,400,000	$2,500,000	$3,000,000	$0	$0

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
B. Expand access to multi-media classrooms and student computer labs.								
Multi-media Classrooms **15 classrooms/10,000 FTES**		**GartnerGroup Report**	**Allocation (FTES)**					
Projection unit	$7,000							
Cable 50 - 100 feet	$500							
High-quality speakers	$500							
Ceiling projector mount	$1,000							
Large Screen	$300							
Mixing Panel	$350							
Custom Equipment Cart	$750							
Mac & PC	$4,000							
Lighting System	$6,000							
VCR	$300	**single classroom $20,700**						
Project Total				$0	$6,000,000	$6,000,000	$6,000,000	$6,000,000
Incremental Cost				$0	$6,000,000	$0	$0	$0
Instructional Support **Student Computer Labs** Instructional aides in computer labs for students to provide assistance in the use of equipment and software @ $28,855 salary + benefits/aide		**Telecommunications and Technology Advisory Committee Work Group**	**Allocation (FTES)**					
Project Total				$0	$12,305,000	$25,181,303	$38,628,909	$38,628,909
Incremental Cost				$0	$12,305,000	$12,876,303	$13,447,606	$0
Goal B. Subtotal				$0	$18,305,000	$31,181,303	$44,628,909	$44,628,909
Goal B. Incremental Cost				$0	$18,305,000	$12,876,303	$13,447,606	$0

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
C. To ensure that all students, regardless of disabilities, will receive the benefits from such technology in their student services and instructional programs.								
Access to Print Information		**Disabled Students Programs and Services (DSPS) Analysis**	**DSPS**					
Individual College Braille Equipment				$588,500	$0	$0	$0	$0
Alternate Text Prod. Ctr.								
Equipment				$100,500	$0	$0	$0	$0
Staffing				$415,000	$415,000	$415,000	$415,000	$415,000
Other Operating Costs				$182,000	$182,000	$182,000	$182,000	$182,000
Access to Distance Education								
Caption Video Based Instruction				$2,520,000	$2,520,000	$2,520,000	$2,520,000	$2,520,000
Editing Decks				$1,070,000	$0	$0	$0	$0
Live Captioning				$0	$828,000	$828,000	$828,000	$828,000
College Technical Assistance/Faculty Support								
HTC Specialist per college				$6,420,000	$6,420,000	$6,420,000	$6,420,000	$6,420,000
HTCTU - CVU/Campus Support				$281,716	$281,716	$281,716	$281,716	$281,716
Project Total				$11,577,716	$10,646,716	$10,646,716	$10,646,716	$10,646,716
Incremental Cost				$11,577,716	($931,000)	$0	$0	$0
Goal C. Subtotal				$11,577,716	$10,646,716	$10,646,716	$10,646,716	$10,646,716
Goal C. Incremental Cost				$11,577,716	($931,000)	$0	$0	$0
D. Improve faculty and student access to automated library and learning resources including electronic information databases and administrative services.								
Virtual Library & Learning Resources	**per college**	**Library & Learning Resources Program Annual Data Survey**	**Allocation**					
Personnel - Technical staff support (salary + benefits, one/college)	$93,458				$0	$10,000,000	$10,000,000	$10,000,000
Equipment/hardware/software (includes assistive technologies).	$28,037				$0	$3,000,000		
Training/staff development.	$9,346	$130,841/college			$0	$1,000,000		
Project Total				$0	$0	$14,000,000	$10,000,000	$10,000,000
Incremental Cost				$0	$0	$14,000,000	($4,000,000)	$0

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Library Access for the Disabled and Learning Assistance	per college	Library & Learning Resources Program Annual Data Survey	Allocation					
Access:								
Workstations for the disabled	$60,000			$0	$6,360,000	$0	$0	$0
Training for workstations	$800			$0	$85,600	$85,600	$85,600	$85,600
Replacement/upgrade of workstations	$5,000			$0	$535,000	$535,000	$535,000	$535,000
Learning Assistance:								
Technical Infrastructure	$15,000			$0	$1,605,000	$0	$0	$0
Ongoing maintenance	$5,161			$0	$552,200	$552,200.25	$552,200.25	$552,200.25
Assistant Learning	$35,000			$0	$3,745,000	$3,745,000	$3,745,000	$3,745,000
Project Total				$0	$12,882,800	$4,917,800	$4,917,800	$4,917,800
Incremental Cost				$0	$12,882,800	($7,965,000)	$0	$0
Electronic Resources Acquisition Subscription - Purchase of library core collection materials	per college	Library & Learning Resources Program Advisory Committee	Allocation					
	$37,383							
Project Total				$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000
Incremental Cost				$4,000,000	$0	$0	$0	$0
Library & Learning Resources Database Maintenance	per college	Library & Learning Resources Program Advisory Committee	Telecommunications & Technology Infrastructure Program					
Library database subscription - Maintenance of library catalogues stored in an interactive U. S. MARC (Machine-readable Cataloging) standard. (cost is for software & a modest amount for equipment)	$56,075	2001-2005						
Project Total				$0	$6,000,000	$6,000,000	$6,000,000	$6,000,000
Incremental cost				$0	$6,000,000	$0	$0	$0

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Library & Learning Resources Automation Maintenance	per college	Library & Learning Resources Program Advisory Committee	Telecommunications & Technology Infrastructure Program					
Software upgrades & maintenance for circulation, acquisitions, serials control, etc. modules	$79,439				$8,500,000	$8,500,000	$8,500,000	$8,500,000
Maintenance cost for software with a very modest of equipment.	$9,346				$500,000	$1,500,000	$1,000,000	$1,000,000
Project Total				$0	$9,000,000	$10,000,000	$9,500,000	$9,500,000
Incremental Cost				$0	$9,000,000	$1,000,000	($500,000)	$0
Goal D. Subtotal				$4,000,000	$31,882,800	$38,917,800	$34,417,800	$34,417,800
Goal D. Incremental Cost				$4,000,000	$27,882,800	$7,035,000	($4,500,000)	$0
E. Develop a centralized Web-based resource center for materials, resources, and processes with full faculty access to support the best practices in curriculum and instruction.								
On-Line Curriculum and Instruction		Telecommunications and Technology Infrastructure Program	Systemwide Project					
Hardware/Software	75%			$375,000	$900,000	$675,000	$675,000	$675,000
Personnel	25%			$125,000	$300,000	$225,000	$225,000	$225,000
Project Total				$500,000	$1,200,000	$900,000	$900,000	$900,000
Incremental Cost				$500,000	$700,000	($300,000)	$0	$0
Goal E. Subtotal				$500,000	$1,200,000	$900,000	$900,000	$900,000
Goal E. Incremental Cost				$500,000	$700,000	($300,000)	$0	$0
F. Integrate technology into college offices/support areas to ensure that staff have the tools/training required to deliver services to students and faculty efficiently and effectively.								
Training (Staff) A technology training fund allocated to colleges to help facilitate the training of staff in the use of telecommunications and technology		Telecommunications and Technology Infrastructure Program	Allocation Full Time Staff					
Project Total				$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000
Incremental Cost				$7,000,000	$0	$0	$0	$0
Training For Technical Staff This is to facilitate the ongoing training for staff who are responsible for technical support		GartnerGroup Report	Allocation Full time Staff					
Project Total				$0	$848,000	$848,000	$848,000	$848,000
Incremental Cost				$0	$848,000	$0	$0	$0
Goal F. Subtotal				$7,000,000	$7,848,000	$7,848,000	$7,848,000	$7,848,000
Goal F. Incremental Cost				$7,000,000	$848,000	$0	$0	$0

* Funds are allocated by FTES, FTEF, systemwide projects, or competition for local grants.

Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
G. Improve/maintain systemwide networks to support telecommunication needs of the system. Also develop/support a technical planning guide and fund the local development of technical plans.								
4CNet College Connectivity (On-going Project)		**4CNet Cost Estimates**	**Systemwide Project**					
Data Connectivity/Backbone & Video Conferencing for CCCs				127 sites	127+ sites + DS3	127+ sites	127+ sites	127+ sites
Project Total				**$13,764,475**	**$18,651,458**	**$25,778,044**	**$17,763,054**	**$17,763,054**
Incremental Cost				**$13,764,475**	**$4,886,983**	**$7,126,586**	**($8,014,990)**	**$0**
Collaboration Resources (Audio/Data) To develop a collaboration tool to support consultation, distance education, and governance		**Cost estimate from '98 Fund for Instructional Improvement Grant**	**Systemwide Project**					
Hardware/Software				$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Maintenance/Support				$100,000	$100,000	$100,000	$100,000	$100,000
Networking (800#)				$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Personnel				$200,000	$200,000	$200,000	$200,000	$200,000
Project Total				**$2,300,000**	**$2,300,000**	**$2,300,000**	**$2,300,000**	**$2,300,000**
Incremental Cost				**$2,300,000**	**$0**	**$0**	**$0**	**$0**
Satellite Uplink Facility (On-going Project) to distribute video telecourses in the state		**Technology Statewide Project (TSP)**	**Systemwide Project**					
Project Total				**$2,000,000**	**$2,000,000**	**$2,000,000**	**$2,000,000**	**$2,000,000**
Incremental Cost				**$2,000,000**	**$0**	**$0**	**$0**	**$0**
Data/Video Connectivity to Official Off-campus Ctrs (55) This will facilitate the connections of campus centers to the statewide data and video network.		**4CNet Cost Estimates**	**Allocation by site**					
Data connection					$35,200/site	$34,000/site	$34,000/site	$34,000/site
Video Connection					$50,000/site	$20,000/site	$20,000/site	$20,000/site
Project Total				**$0**	**$4,686,000**	**$2,970,000**	**$2,970,000**	**$2,970,000**
Incremental Cost				**$0**	**$4,686,000**	**($1,716,000)**	**$0**	**$0**

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Goal/Project	%/ $	Basis for Cost Estimates	* Funding Method for Distribution	Year 2000/01	Year 2001/02	Year 2002/03	Year 2003/04	Year 2004/05
Local Technology Planning/ Other Optional Areas Plan/develop districtwide area networks Develop, implement, and/or evaluate local technology applications for student learning/instructional services, student services, and admin. services.		**Telecommunications and Technology Infrastructure Program**	**Allocation by site**					
Project Total			126 sites	$3,072,983	$0	$0	$0	$0
Incremental Cost				$3,072,983	($3,072,983)	$0	$0	$0
Goal G. Subtotal				$21,137,458	$27,637,458	$25,033,054	$25,033,054	$25,033,054
Goal G. Incremental Cost				$21,137,458	$6,500,000	($2,604,404)	$0	$0
H. Expand and organize the appropriate administrative structure in the Chancellor's Office, including the establishment of a senior level management position.								
Oversight/Audit New staff in the Chancellor's Office to coordinate implementation of this plan		**GartnerGroup Report Cost Breakdown**	**State Operations**					
Vice Chancellor		$2,900,000						
Specialist		$28,000,000						
Telecommunications Manager I		$11,577,716						
Office Technician		$42,477,716	$16,300,000					
Project Total				$0	$381,498	$381,498	$381,498	$381,498
Incremental Cost				$0	$381,498	$0	$0	$0
Goal H. Subtotal				$0	$381,498	$381,498	$381,498	$381,498
Student Success Goal Total				$54,615,174	$110,801,472	$130,808,371	$139,755,977	$139,755,977
Student Success Goal Incremental $				$54,615,174	$56,186,298	$20,006,899	$8,947,606	$0
TECH II Annual TOTAL		**base year funding 1999-2000**	**$30,900,000**	$58,777,716	$177,039,323	$224,319,486	$238,668,942	$243,494,291
Tech II Annual Incremental $				$27,877,716	$118,261,607	$47,280,164	$14,349,455	$4,825,350

Documents referred to in this spreadsheet may be obtained by contacting the Chancellor's Office at (916) 323-4277 or by e-mail at cmawson@cccco.edu.

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